

PROPOSED MIXED-USE DEVELOPMENT OF PORTION 5 OF BRANDKOP FARM NO. 702 IN BLOEMFONTEIN, MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE PROVINCE

Environmental Impact Assessment Report

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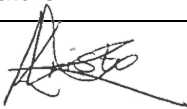

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Amendments Page

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Executive Summary

PROJECT BACKGROUND AND MOTIVATION

The Mangaung Metropolitan Municipality proposes to develop a Mixed-Use Development of Portion 5 of Brandkop Farm No. 702 in Bloemfontein, Free State Province. According to the Mangaung Metropolitan Municipality Integrated Development Plan, the Mangaung Metropolitan Municipality attempts to safeguard the development of suitably located housing, with the Brandkop Farm No. 702 being one of the proposed land parcels. The strategic need for this development is to improve urban integration to redress spatial imbalances of the past.

The aim of the proposed development is to provide residential housing units. In addition, the proposed development also makes provision for supportive land uses such as business, education and community facilities that are primarily intended to serve the residents of proposed development.

The location of new housing projects is mainly driven by the Spatial Development Framework, which makes provision for both public and private initiated developments within the urban edge. Apart from the Informal Settlements Upgrading Strategy that deals with informal settlements only, several priority locations have been identified for future development within Mangaung. This includes portion 5 of the Brandkop Farm No. 702 in Bloemfontein.

Therefore there is a need for housing developments within the Bloemfontein area and the proposed Brandkop Mixed-Use Development will cater for these needs. The residential units will consist of multi-storey walk up units, gap housing and conventional housing. The Brandkop Mixed-Use Development will also include institutional and educational facilities such as schools and community centres. Provision will also be made for business (convenience retail and commercial) facilities. Transport facilities such as buses and taxi's will be provided for to connect the development to the Lourier Park and Pellissier areas and therefore to the greater Bloemfontein area. Public open spaces (including conservation areas) will enhance the sense of place and living environment.

PROJECT LOCATION

The site is located on the south western outskirts of Bloemfontein. The north eastern boundary of the proposed site comprises the suburb of Pellissier. The R706 (Jagersfontein Road) forms the south eastern boundary of the proposed site. The south western boundary of the proposed site consists of agricultural land forms. The north western boundary consists of open municipal land. The proposed site occurs on Portion 5 of Brandkop Farm No. 702.



Locality Map

PROJECT DESCRIPTION

The main features of the proposed land use zones for the development include the following:

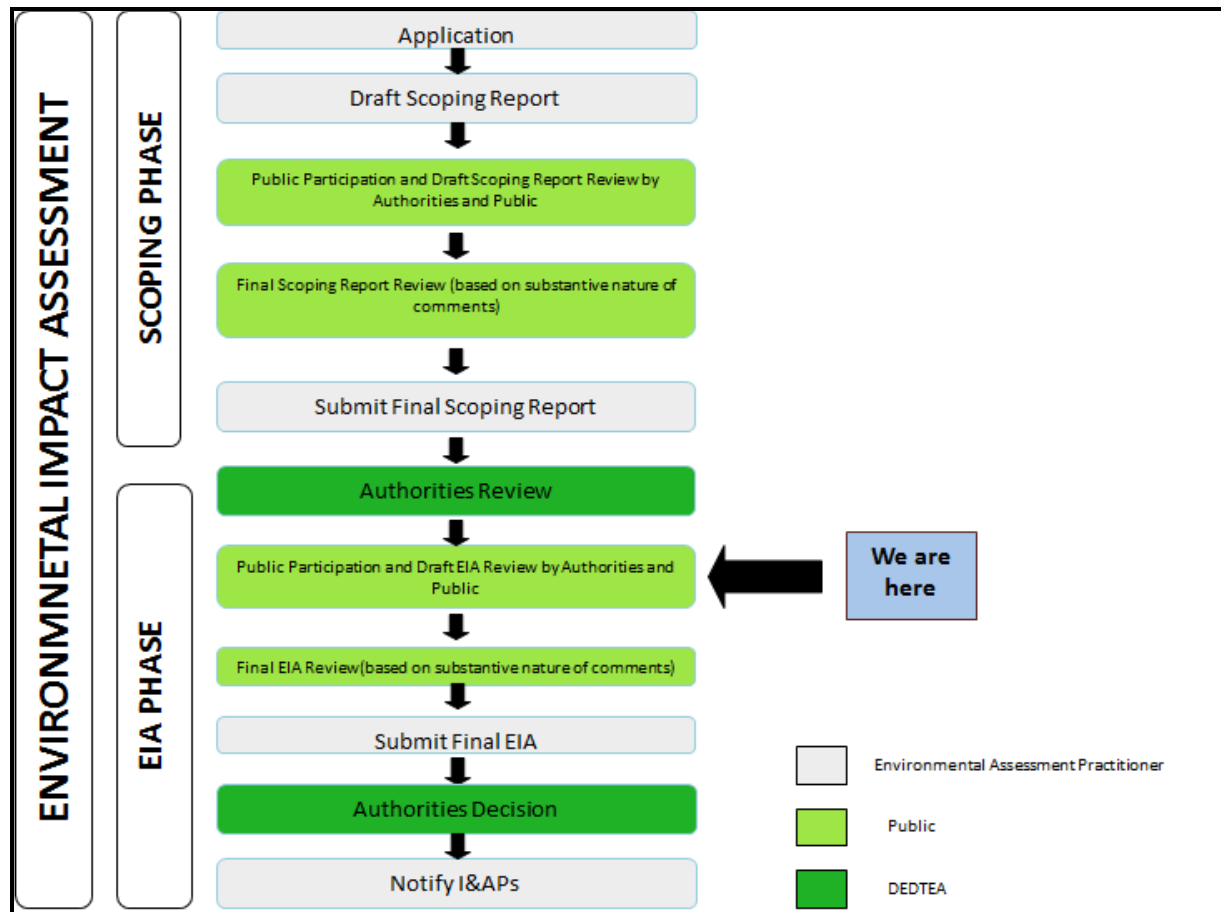
- Conventional Housing Residential units;
- Multi-storey Walk Up Residential units;
- Gap Housing Residential units;
- Institutional facilities;
- Educational facilities;
- Business (convenience retail and commercial) facilities;
- Bus and taxi facilities;
- Roads; and
- Public open spaces (including conservation areas).

SCOPING AND EIA PROCESS

The proposed Brandkop Mixed-Use Development entails certain activities that require authorisation in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998). The process for seeking authorisation is undertaken in accordance with the EIA

Regulations (GN No. R. 543, R. 544, R. 545 and R. 546 of 18 June 2010), promulgated in terms of Chapter 5 of NEMA. Subsequently, the 2010 EIA Regulations were amended in 2014; however, the Brandkop Mixed-Use Development Application is in line with the 2010 EIA Regulations. Based on the types of activities involved which include activities listed in GN No. R. 544 and R. 545 of 18 June 2010; the requisite environmental assessment for the project is a Scoping and EIA process.

In terms of the Regulations, the lead decision-making authority for the environmental assessment is the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEa) as the project proponent is the Mangaung Metropolitan Municipality. Nema Consulting was appointed by Mangaung Metropolitan Municipality as the independent EAP to undertake the Environmental Authorisation for the proposed construction of the Brandkop Mixed-Use Development.



ALTERNATIVES

Layout/Design alternatives have been deemed the most suitable for this proposed development as they allow for the most input from specialists. Two layout alternatives are assessed in the report.

PROFILE OF THE RECEIVING ENVIRONMENT

The EIA Report provides a general description of the status quo of the receiving environment in the project area, and also provides local and site-specific discussions on those environmental features investigated by the respective specialists. This allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project.

The study area includes the entire footprint of all the project components, which includes the construction domain and surrounding receiving environment.

The receiving environment is assessed and discussed in terms of the following:

1. Climate
2. Geology
3. Topography
4. Surface Water
5. Flora
6. Fauna
7. Land Capability
8. Heritage
9. Air Quality
10. Noise
11. Planning
12. Infrastructure
13. Availability of Services
14. Access Roads
15. Waste Management
16. Visual Aesthetics
17. Socio-Economic Environment

SPECIALIST STUDIES

The requisite Specialist Studies 'triggered' by the findings of the Scoping process, aimed at addressing the key issues and compliance with legal obligations, include:

1. Terrestrial Ecological Assessment;
2. Wetland Delineation and Aquatic Health Assessment;
3. Visual Impact Assessment.
4. Agricultural Potential Study;
5. Phase 1 Heritage Impact Assessment; and
6. Paleontological Impact Assessment.

The information obtained from the respective Specialist Studies was incorporated into the EIA report in the following manner:

1. The assumptions and limitations identified in each study were noted.
2. The information was used to complete the description of the receiving environment in a more detailed and site-specific manner;
3. A summary of each specialist study, focusing on the approach to the study, key findings and conclusions drawn;
4. The Specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment;
5. The evaluations performed by the specialists on the alternatives of the project components were included in the comparative analysis to identify the most favourable option;
6. Specialist input was obtained to address comments made by IAPs that related to specific environmental features pertaining to each specialist discipline; and
7. Salient recommendations made by the specialists were taken forward to the EIA Conclusions and Recommendations.

IMPACT ASSESSMENT

This EIA Report focuses on the pertinent environmental impacts that could potentially be caused by the proposed Brandkop Mixed-Use Development during the pre-construction, construction and operational phases of the project.

Impacts were identified as follows:

- Impacts associated with listed activities contained in GN No. R. 544, R. 545 and R. 546 of 10 June 2010, for which authorisation has been applied for;
- An appraisal of the project activities and components;
- Issues highlighted by environmental authorities;
- Comments received during public participation;
- An assessment of the receiving biophysical, social, economic and technical environment; and
- Findings from Specialist Studies.

The impacts and the proposed management measures are discussed on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts. The assessment considered impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

The proposed mitigation of the impacts associated with the project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. The Environmental Management Programme (EMPr) provides a comprehensive

list of mitigation measures for specific elements of the project, which extends beyond the impacts evaluated in the body of the EIA Report.

Cumulative impacts are discussed in terms of traffic, protected and endangered fauna and flora species, invasive and alien plant species, and soil erosion cumulative impacts related to the Brandkop Mixed-Use Development.

ANALYSIS OF ALTERNATIVES

The EIA Report provides an appraisal of all the environmental and technical considerations associated with the various alternatives through a comparative analysis to eventually distil the Best Practicable Environmental Option.

The majority of the Specialist Studies had no alternative layout preference, yet the technical team have a strong preference for Alternative layout 1.

Thus in terms of the biophysical and cultural environment, there was no preference in alternatives. With regards to economic and technical environment, Alternative 1 is preferred.

PUBLIC PARTICIPATION

The EIA Report provides a full account of the public participation process that was followed for the EIA phase for the proposed project.

The public review of the Draft EIA Report will occur for a 30-Day review period from 26 May 2016 to 27 June 2016. The authority review of the Draft EIA Report will take place from 26 May 2016 to 05 July 2016 (40-Day review). The Public Meeting is scheduled to take place on 02 June 2016.

Registered IAPs and authorities will be granted an opportunity to review and comment on the Final EIA Report. A link on Dropbox containing the electronic Final EIA Report will be sent to authorities and registered IAPs only. Any further comments from registered IAPs will be forwarded to the Competent Authority.

All authorities and registered IAPs will be notified via email or SMS after having received written notice from DESTEA on the final decision for the project. Advertisements will also be placed as notification of the Department's decision. These notifications will include the appeal procedure to the decision and key reasons for the decision. A copy of the decision will also be provided to IAPs on request.

EIA CONCLUSIONS AND RECOMMENDATIONS

Attention is drawn to specific sensitive environmental features (with an accompanying sensitivity map) for which mitigation measures are included in the EIA Report and EMPr.

An Environmental Impact Statement is provided and critical environmental activities that need to be executed during the project life-cycle are also presented.

With the selection of the BPEO, the adoption of the mitigation measures include in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

The EIA Report is concluded with key recommendations, which may also influence the conditions of the Environmental Authorisation (where relevant).

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List of Abbreviations

BID	Background Information Document
BPEO	Best Practicable Environmental Option
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture, Forestry and Fisheries
DESTEA	Department of Economic, Small Business Development, Tourism and Environmental Affairs – Free State Province
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
GIS	Geographic Information System
GN	Government Notice
ha	Hectare
HIA	Heritage Impact Assessment
IAP	Interested and Affected Party
IBA	Important Bird and Biodiversity Area
IDP	Integrated Development Plan
IUCN	International Union for Conservation of Nature
Kl/d	Kilolitre per Day
km	Kilometre
m ³	Cubic metre
mm	Millimetre
MMM	Mangaung Metropolitan Municipality
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
MVA	Megavolt ampere
NEMA	National Environmental Management Act
NEM:AQA	National Environmental Management: Air Quality Act
NEM:BA	National Environmental Management: Biodiversity Act
NEM:WA	National Environmental Management: Waste Act
NGO	Non-Government Organisation
NWA	National Water Act

OHS	Occupational Health and Safety
QDS	Quarter Degree Square
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
ToR	Terms of Reference
WMA	Water Management Area

Definitions of Key Terms

Term	Definition
Alternatives	In terms of the 2014 EIA Regulations, alternatives refer to the different means of meeting the general purpose and requirements of the activity, which may include alternatives to: <ol style="list-style-type: none"> property or location where the activity is proposed to be undertaken; type of activity to be undertaken; design or layout of the activity; technology to be used in the activity; or operational aspects of the activity; And includes the option of not implementing the activity.
Application	In terms of the 2014 EIA Regulations (GN No. R. 982), this is defined as an Application for: <ol style="list-style-type: none"> environmental authorisation in terms of Chapter 4 amendment to an environmental authorisation in terms of Chapter 5 amendment to an EMPr in terms of Chapter 5 amendment of a closure plan in terms of Chapter 5
Biodiversity	The variety of life forms, including the plants, animals and micro-organisms, the genes they contain and the ecosystems and ecological processes of which they are a part.
Cumulative Impact	In relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.
Development	The building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity, including any associated post development monitoring, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or borrow pits, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.
Disposal (waste)	Burial, deposit, discharge, abandoning dumping, placing or release of any waste into, or onto, any land.
Endangered	A taxon is regarded as endangered when it faces a high risk of extinction in the wild. This is defined as a 20% probability of extinction within 20 years.
Environment	The biophysical, social, economic, cultural, political and historical context within which people live and within which development takes

Term	Definition
	place.
Environmental Impact	A change resulting from the effect of an activity on the environment, whether desirable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them.
Environmental Impact Assessment	A systematic process of identifying, assessing and reporting environmental impacts associated with an activity.
Environmental Issue	A concern felt by one or more parties about some existing, potential or perceived environmental impact.
Environmental Management Programme	A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.
Gross Value Added	Gross Value Added is a measure of output (total production) which measures the total output of a region by considering the value that was created within that region.
Groundwater	Sub-surface water in the zone in which permeable rocks, and often the overlying soil, are saturated.
Habitat	The place where a population (e.g. animal, plant, micro-organism) lives and its surroundings, both living and non-living.
Heritage Resource	Any place or object of cultural significance including buildings, structures, landscapes, graves and geological, archaeological and palaeontological sites.
Independent	relation to an EAP, a specialist or the person responsible for the preparation of an environmental audit report, means: a) that such EAP, specialist or person has no business, financial, personal or other interest in the activity or application in respect of which that EAP, specialist or person is appointed in terms of these Regulations; or b) that there are no circumstances that may compromise the objectivity of that EAP, specialist or person in performing such work. Excluding: i. normal remuneration for a specialist permanently employed by the EAP; or ii. fair remuneration for work performed in connection with that activity, application or environmental audit;
Interested and Affected Party	Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.
Mitigation	To anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.
Pollution	Any change in the environment caused by substances, radioactive or

Term	Definition
	other waves, or noise, odours, dust or heat, emitted from any activity where there is an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future. Furthermore, pollution can also be regarded as an undesirable state of the natural environment being contaminated with harmful substances as a consequence of human activities.
Population	Population is defined as the total number of individuals of the species or taxon.
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.
Riparian Habitat	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.
Scoping	This refers to the process of determining the spatial and temporal boundaries (the extent) for the EIA and key issues to be addressed in an environmental assessment.
Significant Impact	An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence.
Specialist	A person that is generally recognised within the scientific community as having the capability of undertaking, in conformance with generally recognised scientific principles, specialist studies or preparing specialist reports, including due diligence studies and socio-economic studies.
Species	A group of organisms that resemble each other to a greater degree than members of other groups and that form a reproductively isolated group that will not produce viable offspring if bred with members of another group.
Storage (waste)	The accumulation of waste in a manner that does not constitute treatment or disposal of that waste.
Taxon (Taxa):	Any group of organisms considered to be sufficiently distinct from other such groups to be treated as a separate unit.
Throughput Capacity	The design capacity or maximum capable capacity of a facility, structures or infrastructure, whichever is the greater.
Treatment	Any method, technique or process that is designed to- a) change the physical, biological or chemical character or

Term	Definition
	<p>composition of a waste;</p> <p>b) remove, separate, concentrate or recover a hazardous or toxic component of a waste; or</p> <p>c) destroy or reduce the toxicity of a waste.</p> <p>In order to minimise the impact of the waste on the environment prior to further use or disposal.</p>
Urban Edge	<p>Areas situated within the urban edge (as defined or adopted by the competent authority), or in instances where no urban edge or boundary has been defined or adopted, it refers to areas situated within the edge of built-up areas.</p>
Vulnerable	<p>A taxon is vulnerable when it is facing a medium risk of extinction in the wild in the medium-term future, defined as a 10% probability of extinction within 100 years.</p>
Waste	<p>Any substance, whether or not that substance can be reduced, re-used recycled and recovered –</p> <p>a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;</p> <p>b) which the generator has no further use of for the purposes of production;</p> <p>c) that must be treated or disposed of;</p> <p>d) that is identified as a waste by the Minister by notice in the Gazette</p> <p>and includes waste generated by the mining, medical, and other sector, but-</p> <p>i) a by-product is not considered waste;</p> <p>ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste.</p>
Watercourse	<p>The National Water Act defines a watercourse as:</p> <p>a) A river or spring;</p> <p>b) A natural channel in which water flows regularly or intermittently;</p> <p>c) a wetland, pan, lake or dam into which, or from which, water flows; and 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</p> <p>a reference to a watercourse includes, where relevant, its bed and banks;</p>
Wetland	<p>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.</p>

1 DOCUMENT ROADMAP

This document serves as the Draft Environmental Impact Assessment (EIA) Report for the proposed Brandkop Mixed-Use Development, in the Free State Province. The Application for Environmental Authorisation for the proposed Brandkop Mixed-Use Development falls under the previous EIA Regulations: Government Notice (GN) No. R. 543 of 18 June 2010 as it was submitted prior to the gazetting of the current EIA Regulations: GN No. R. 982 of 04 December 2014. As this is a transitional period (being that the application was submitted in terms of the 2010 EIA Regulations but the 2014 EIA Regulations are now gazetted), the requirements of both the 2010 and 2014 EIA Regulations will be adhered to as far as possible.

In order to provide clarity to the reader, a document roadmap is provided below. The document roadmap provides information on both the 2010 EIA and 2014 EIA Regulations requirements as well as a guide on the content of each chapter. Please note that in some cases more information is provided than required in the EIA regulations in which case there will be no correlating section to either the 2010 or 2014 EIA Regulations.

Table 1: Document Roadmap

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
1.	Document Roadmap	-	-	-	-
2.	Purpose of this Document	-	-	-	-
3.	Environmental Assessment Practitioner	31(2)(a)	Details of – i) the EAP who compiled the report; and ii) the expertise of the EAP to carry out an environmental impact assessment.	3 (a)	Details of – i) the EAP who prepared the report; and ii) the expertise of the EAP, including a curriculum vitae.
4.	Project Background and Motivation	31(2)(f)	A description of the need and desirability of the proposed activity.	3 (f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
5.	Project Location	31(2)(c)	A description of the property on which the activity is to be undertaken and the location of the activity on the property.	3 (b)	<p>The location of the activity including –</p> <ul style="list-style-type: none"> i) The 21 digit Surveyor General code of each cadastral land parcel; ii) Where available, the physical address and farm name; and iii) Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property or properties.
				3 (c)	<p>A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or if it is –</p> <ul style="list-style-type: none"> i) A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is undertaken; and ii) On land where the property has not been defined, the coordinates within which the activity is to be undertaken.
6.	Project Description	31(2)(b)	A detailed description of the proposed activity.	3 (d)	<p>A description of the scope of the proposed activity, including –</p> <ul style="list-style-type: none"> i) All listed and specified activities triggered and being applied for; and ii) A description of the associated structures and infrastructure related to the development.

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
				3 (g)	A motivation for the preferred development footprint within the approved site.
				3 (t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.
7.	Legislation and Guidelines Considered	-	-	3 (e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.
8.	Scoping and EIA Process	-	-	-	An indication of any deviation from the approved scoping report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks (ii) a motivation for the deviation
9.	Assumptions and Limitations	31(2)(m)	A description of any assumptions, uncertainties and gaps in knowledge.	3 (p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.
10.	Need and Desirability	31(2)(f)	A description of the need and desirability of the proposed activity.	3 (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity within the context of the preferred location.
11.	Alternatives	31(2)(g)	A description of	3 (h)	i) Details of the

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
			identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment.		development footprint alternatives considered.
12.	Profile of the Receiving Environment	31(2)(d)	A description of the environment that may be affected by the activity.	3 (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including: iv) The environment attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
13.	Summary of Specialist Studies	31(2)(j)	A summary of the findings and recommendations of any specialist report or report on a specialised process.	3 (k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.
14.	Impact Assessment	31(2)(h)	An indication of the methodology used in determining the significance of potential environmental impacts.	3 (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including: v) The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
					<p>impacts, including the degree to which these impacts –</p> <ul style="list-style-type: none"> a. can be reversed; b. may cause irreplaceable loss of resources; and c. can be avoided, managed or mitigated. <p>vi) The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.</p> <p>vii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.</p> <p>viii) The possible mitigation measures that could be applied and level of residual risk.</p>
		31(2)(i)	A description and comparative assessment of all alternatives identified during the environmental impact assessment process.	3 (i)	<p>A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including -</p> <ul style="list-style-type: none"> i) A description of all environmental issues and risks that were identified during the

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
					<p>environmental impact assessment process; and</p> <p>ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.</p>
		31(2)(k)	<p>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.</p>	3 (j)	<p>An assessment of each identified potentially significant impact and risk, including-</p> <p>(i) Cumulative impacts;</p> <p>(ii) The nature, significance and consequences of the impact and risk;</p> <p>(iii) The extent and duration of the impact and risk;</p> <p>(iv) The probability of the impact and risk occurring;</p> <p>(v) The degree to which the impact and risk can be reversed;</p> <p>(vi) The degree to which the impact and risk may cause irreplaceable loss of resources; and</p> <p>(vii) The degree to which the impact and risk can be mitigated.</p>
		31(2)(l)	<p>An assessment of each identified potentially significant impact, including –</p> <p>i) Cumulative impacts;</p> <p>ii) The nature of the impact;</p> <p>iii) The extent and duration of the impact;</p> <p>iv) The probability of the impact occurring;</p> <p>v) The degree to which the impact can be reversed;</p> <p>vi) The degree to which the impact may cause irreplaceable</p> <p>vii) Loss of resources; and</p>		

Chapter	Title	Correlation with GN No. R. 543	Correlation with Appendix 3 of GN No. R. 982
			viii) The degree to which the impact can be mitigated.
15.	Analysis of Alternatives	31(2)(g)	<p>A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment.</p> <p>3 (h)</p> <p>A full description of the process followed to reach the proposed development footprint within the approved site, including:</p> <p>ix) If no alternative development locations for the activity were investigated, the motivation for not considering such.</p> <p>x) A concluding statement indicating the preferred alternative development location within the approved site.</p> <p>3 (n)</p> <p>The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.</p>
16.	Public Participation	31(2)(e)	<p>Details of the public participation process conducted in terms of subregulation (1), including:</p> <p>i) Steps undertaken in accordance with the plan of study;</p> <p>ii) A list of persons, organisations and organs of state that were registered as interested and affected parties;</p> <p>iii) A summary of comments received from, and</p> <p>3 (h)</p> <p>A full description of the process followed to reach the proposed development footprint within the approved site, including:</p> <p>ii) Details of the public participation process undertaken in terms of regulation 41 of the Regulations including copies of the supporting documents and inputs; and</p> <p>iii) A summary of the issues raised by interested and affected parties, and</p>

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
			<p>a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and</p> <p>iv) Copies of any representations and comments received from registered interested and affected parties;</p>		<p>an indication of the manner in which the issues were incorporated, or the reasons for not including them.</p>
17.	EAP Conclusions and Recommendations	31(2)(n)	<p>A reasoned 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.</p>	3 (l)	<p>An environmental impact statement which contains -</p> <p>i) A summary of the key findings of the environmental impact assessment;</p> <p>ii) A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and</p> <p>iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.</p>
		31(2)(o)	<p>An environmental impact statement which contains –</p> <p>i) A summary of the</p>	3 (m)	<p>Based on the assessment, and where applicable, recommendations from specialist reports, the</p>

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
			<p>key findings of the environmental impact assessment; and</p> <p>ii) A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives.</p>		<p>recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.</p>
				3 (o)	<p>Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.</p>
				3 (q)	<p>A reasoned opinion as to whether the proposed 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.</p>
18.	Oath of EAP	-	-	3 (s)	<p>An undertaking under oath or affirmation by the EAP in relation to:</p> <p>(i) The correctness of the information provided in the reports;</p> <p>(ii) The inclusion of comments and inputs from stakeholders and I&APs;</p> <p>(iii) The inclusion of inputs and recommendations from the specialist reports where relevant; and</p> <p>(iv) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected</p>

Chapter	Title	Correlation with GN No. R. 543		Correlation with Appendix 3 of GN No. R. 982	
					parties.
19.	References	-	-	-	-
	Not Applicable	-	-	3 (r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.
	Not Applicable	-	-	3 (u)	An indication of any deviation from the approved scoping report, including the plan of study, including- i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks ii) (ii) a motivation for the deviation
	Not Applicable	31(2)(r)	Any specific information that may be required by the competent authority.	3 (v)	Any specific information that may be required by the competent authority.
	Not Applicable	31(2)(s)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act.	3 (w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.

The following has also been included in the Appendices to meet the requirements of the 2010 and 2014 EIA Regulations:

Appendix	Title	Correlation with GN No. R. 543	Correlation with GN No. R. 982
F	Specialist Studies	31(2)(n)	Appendix 6
G	Environmental Management Programme (EMPr)	31(2)(p)	Appendix 4

2 PURPOSE OF THIS DOCUMENT

The Draft EIA Report is a very important document as it concludes the second and final phase of the EIA process. The Draft EIA Report aims to outline the final process to be undertaken in line with the approved plan of study for the proposed Brandkop Mixed-Use Development as well as to set out the environmental impacts, mitigation, closure outcomes, and the residual risks of the proposed activity.

Further, according to Appendix 3 of the 2014 EIA Regulations (GN No. R. 982), the objectives of the EIA process are, through consultation, to:

- a) Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- b) Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- c) Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- d) Determine the--
 - i. Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
 - ii. Degree to which these impacts-
 - aa) Can be reversed;
 - bb) May cause irreplaceable loss of resources, and
 - cc) Can be avoided, managed or mitigated;
- e) Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- f) Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- g) Identify suitable measures to avoid, manage or mitigate identified impacts; and
- h) Identify residual risks that need to be managed and monitored.

To date, the Scoping phase for the project has been completed. The Final Scoping Report and Plan of Study for the EIA were approved on 25 November 2015 by the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs

– Free State Province (DESTEA), who is the Competent Authority in respect to this proposed development (**Appendix A**).

The Draft EIA Report will be made available to Interested and Affected Parties (IAPs) for a 30-Day review period and to Authorities for a 40-Day review period. All comments received will be assessed in the Final EIA Report and will also be noted in the Comments and Responses Report. The Final EIA Report will then be made available for further public review at the same time as being submitted to the Free State DESTEA. The Environmental Assessment Practitioner (EAP) will forward all comments received by registered IAPs on the Final Scoping Report to the relevant DESTEA Official to take into consideration when making the decision to approve or reject the Final EIA Report.

3 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed as the independent EAP to undertake the EIA for the proposed Brandkop Mixed-Use Development. In accordance with Regulation 28(1)(a) of GN No. R. 543 of 18 June 2010 and Section 2(a) of Appendix 2 of GN No. R. 982 of 04 December 2014, this section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng), Durban (KwaZulu-Natal), and Rustenburg (North West Province).

The core members of Nemai Consulting that are involved with the Scoping and EIA process for the proposed development are captured in **Table 2** below, and their respective Curricula Vitae are contained in to **Appendix B**.

Table 2: Scoping and EIA Core Team Members

Name	Qualification	Responsibility
Mrs N. Naidoo	BSc – Eng (Chem)	Project Manager and Environmental Engineering
Mr D. Henning	MSc – River Ecology	Technical Input and Quality Review
Ms K. Robertson	MSc – Environmental Sciences	Project Leader on EIA Process, Scoping & EIA Report, and Public Participation

4 PROJECT BACKGROUND AND MOTIVATION

4.1 Introduction

Nemai Consulting was appointed as the independent EAP to undertake the Environmental Authorisation for the proposed construction of the Brandkop Mixed-Use Development. This document serves as the Draft EIA Report for the aforementioned project.

The Mangaung Metropolitan Municipality (MMM) proposes to develop a Mixed-Use Development of Portion 5 of Brandkop Farm No. 702 in Bloemfontein, Free State Province. According to the MMM Integrated Development Plan (IDP), the MMM attempts to safeguard the development of suitably located housing, with the Brandkop Farm No. 702 being one of the proposed land parcels. The strategic need for this development is to improve urban integration to redress spatial imbalances of the past.

The site is located on the south western outskirts of Bloemfontein (**Figure 1**). The north eastern boundary of the proposed site comprises the suburb of Pellissier. The R706 (Jagersfontein Road) forms the south eastern boundary of the proposed site. The south western boundary of the proposed site consists of agricultural land forms. The north western boundary consists of open municipal land.

Access to site can be obtained from the N1 Bloemfontein through the R706 road (**Figure 2**). The proposed development has four proposed access points:

- Access 1 – Besembos Avenue;
- Access 2 – Kokerboom Avenue;
- Access 3 – Near Doringklaat Avenue; and
- Access 4 – Off R706 Road.

The site covers an area of 256 hectares. The proposed development is anticipated to accommodate the following:

- Residential units – consisting of multi-storey walk up units, gap housing and conventional housing;
- Institutional and educational facilities;
- Business (convenience retail and commercial) facilities;
- Bus and taxi facilities;
- Roads; and
- Public open spaces (including conservation areas).



Figure 1: Google Earth locality Map of the proposed development boundaries



Figure 2: Locality Map illustrating the access to the propose development site

The aim of the proposed development is to provide residential housing units. In addition, the proposed development also makes provision for supportive land uses such as business, education and community facilities that are primarily intended to serve the residents of proposed development.

4.2 Brandkop Mixed-Use Development

Mangaung covers 6 863 km² of land and comprises three prominent urban centres, which are largely surrounded by rural areas (MMM IDP, 2013-2014). It is centrally located within the Free State, with Bloemfontein being the capital, as well as the sixth largest city in South Africa. The Bloemfontein area contains more than half of the population (52%) with the Free State. The Mangaung population is growing at a fast pace; according to statistics South Africa (Stats SA) in 2011, there were 747 431 people residing in the jurisdiction of Mangaung. In line with the population growth, there has been an increase in the number of households in Mangaung. In 2001 there were 185 013 households in Mangaung; however, in 2011 they have increased to 231 921. The average household size in 2001 was 3.4% and in 2011 the size has decreased to 3.2%. Mangaung has a huge housing backlog compared with other municipalities in the Free State. More than half of the population resides in Bloemfontein and in particular, in the Mangaung Township area because Bloemfontein is perceived as an economic hub of the City and people believe that there are better work prospects and better living conditions in this region. Mangaung has experienced an increase in the provision of formal housing; while there has been a decrease in the informal dwellings. Part of this decrease could be attributed to more formal houses being provided through some of the government housing programmes.

An internal investigation by the Municipality during 2010 revealed that the current housing backlog stands at approximately 53,820 houses in Mangaung, the bulk of which are residing in the Mangaung Township. This figure has increased to 58 820 during 2011, with the demand mainly found in the affordable (Gap) housing and the rental markets. The City has not been supplying affordable rental housing over a number of years thus compromising on the opportunity to improve spatial integration, urban efficiency, as well as on opening up economic potential in those planned areas where bulk infrastructure, such as sanitation, water and transport may be under-utilised.

The location of new housing projects is mainly driven by the Spatial Development Framework (SDF), which makes provision for both public and private initiated developments within the urban edge. Apart from the Informal Settlements Upgrading Strategy (ISUS) that deals with informal settlements only, several priority locations have been identified for future development within Mangaung. This includes portion 5 of the Brandkop Farm No. 702 in Bloemfontein. In 2013, the MMM adopted an Integrated Human Settlements Plan (IHSP), which main aim was to bring about more integrated development with a combination of

mixed housing typologies. In this plan, the MMM has changed focus from the provision of low-income housing to mixed housing developments, including the provision of “gap market” housing which was neglected for many years. The MMM is currently implementing such as projects in Vista Park 2; Vista Park 3 and Hillside View as pilot projects to provide a range of housing for different typologies and income groups, and must be affordable to all the residents. Another project currently being implemented by the municipality, and that will make a valuable contribution to housing in future, is the Airport Development Node (ADN).

Therefore there is a need for housing developments within the Bloemfontein area and the proposed Brandkop Mixed-Use Development will cater for these needs. The residential units will consist of multi-storey walk up units, gap housing and conventional housing. The Gap housing will cater for people who earn too much to qualify for state assistance (RDP housing), yet earn too little to qualify for home loans in the private property market. Conventional housing provides quality, safe, affordable housing for low and moderate-income families. The Brandkop Mixed-Use Development will also include institutional and educational facilities such as schools and community centres. Provision will also be made for business (convenience retail and commercial) facilities. Transport facilities such as buses and taxi’s will be provided for to connect the development to the Lourier Park and Pellissier areas and therefore to the greater Bloemfontein area. Public open spaces (including conservation areas) will enhance the sense of place and living environment.

5 PROJECT LOCATION

As per R28 (1) (d) of GN No. R. 543 of 18 June 2010 and Section 2 (b) and (c) of Appendix 2 of GN 982 of 04 December 2014, the following information regarding the project location is provided in this section:

- A description of the property on which the activity is to be undertaken and the location of the activity on the property;
- The location of the activity including –
 - The 21 digit Surveyor General code of each Cadastral land parcel;
 - Where available, the physical address and farm name; and
 - Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property or properties.
- A plan which locates the proposed activity or activities applied for at an appropriate scale, or if it is –
 - A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is undertaken; and
 - On land where the property has not yet been defined, the coordinates within which the activity is to be undertaken.

Please note that A3 copies of all maps contained in Section 5 are contained in **Appendix C**.

5.1 Regional and Local Context

Figures 3 and **4** provide the regional and local context of the proposed development, respectively. The site is located in the MMM of Free State Province, South Africa.

The site is located on the south western outskirts of Bloemfontein. The north eastern boundary of the proposed site comprises the suburb of Pellissier. The R706 (Jagersfontein Road) forms the south eastern boundary of the proposed site. The south western boundary of the proposed site consists of agricultural land forms. The north western boundary consists of open municipal land. The land is currently zoned as “Undetermined”.

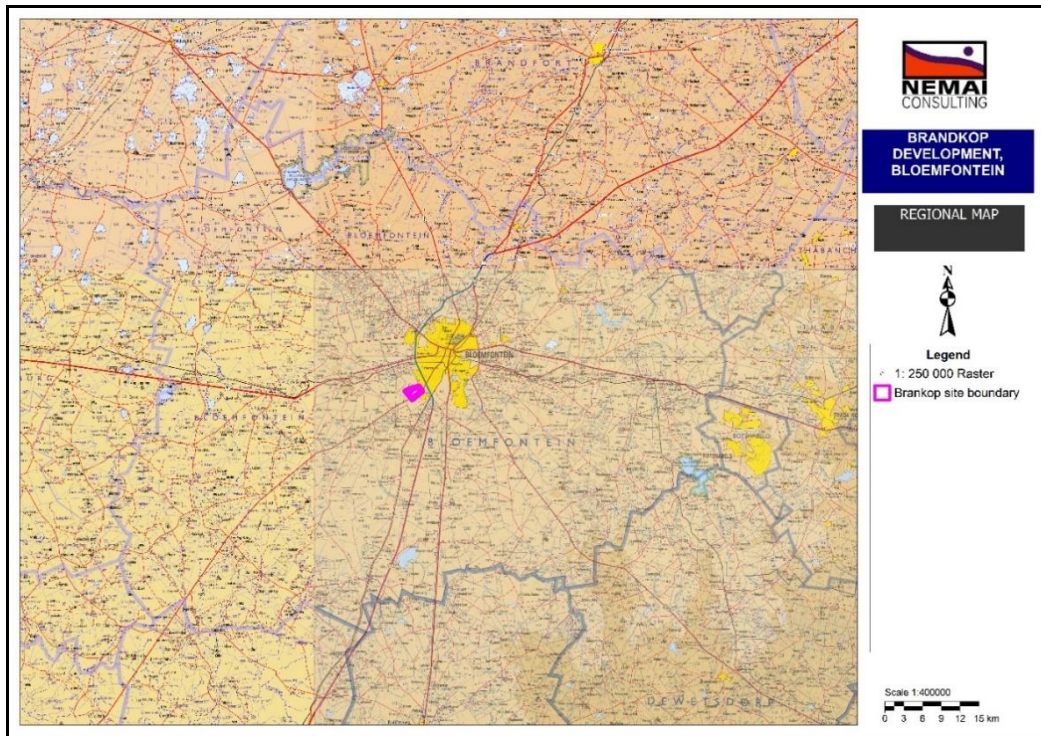


Figure 3: Regional Map

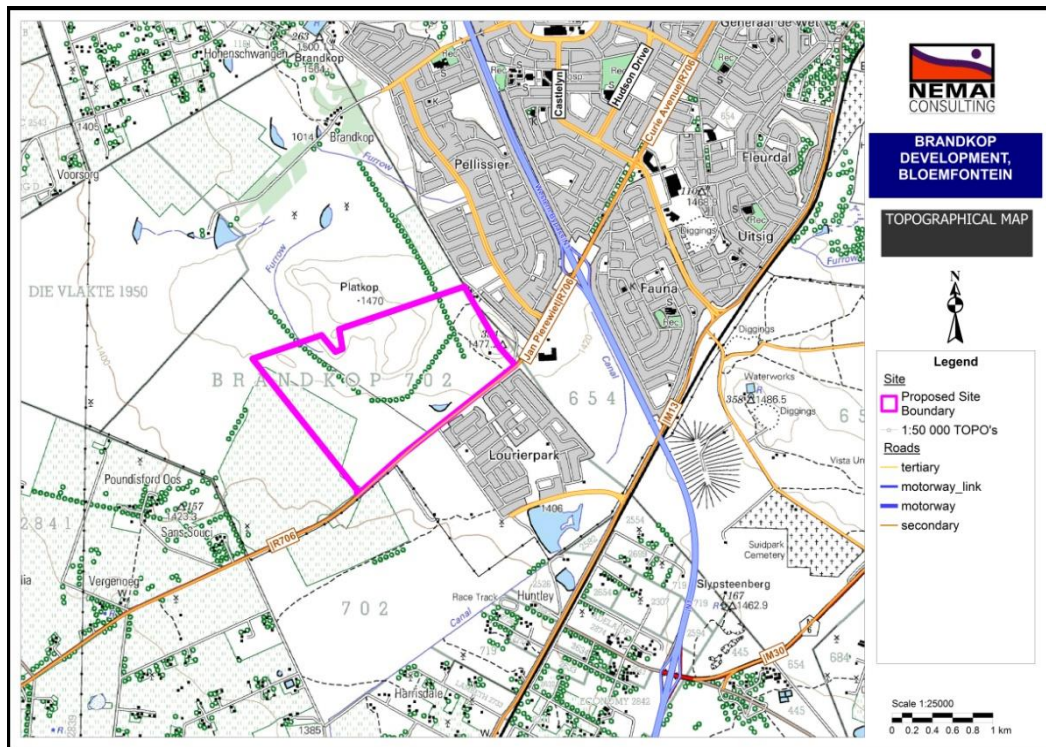


Figure 4: Topographical Map

5.2 Property Description

The proposed site occurs on Portion 5 of Brandkop Farm No. 702 in Bloemfontein (**Figure 5**).

Farm name and number:	Farm Brandkop No. 702
Portion / holding /erf number/	Portion 5
21 Digit Code	T01Q0000000070200005

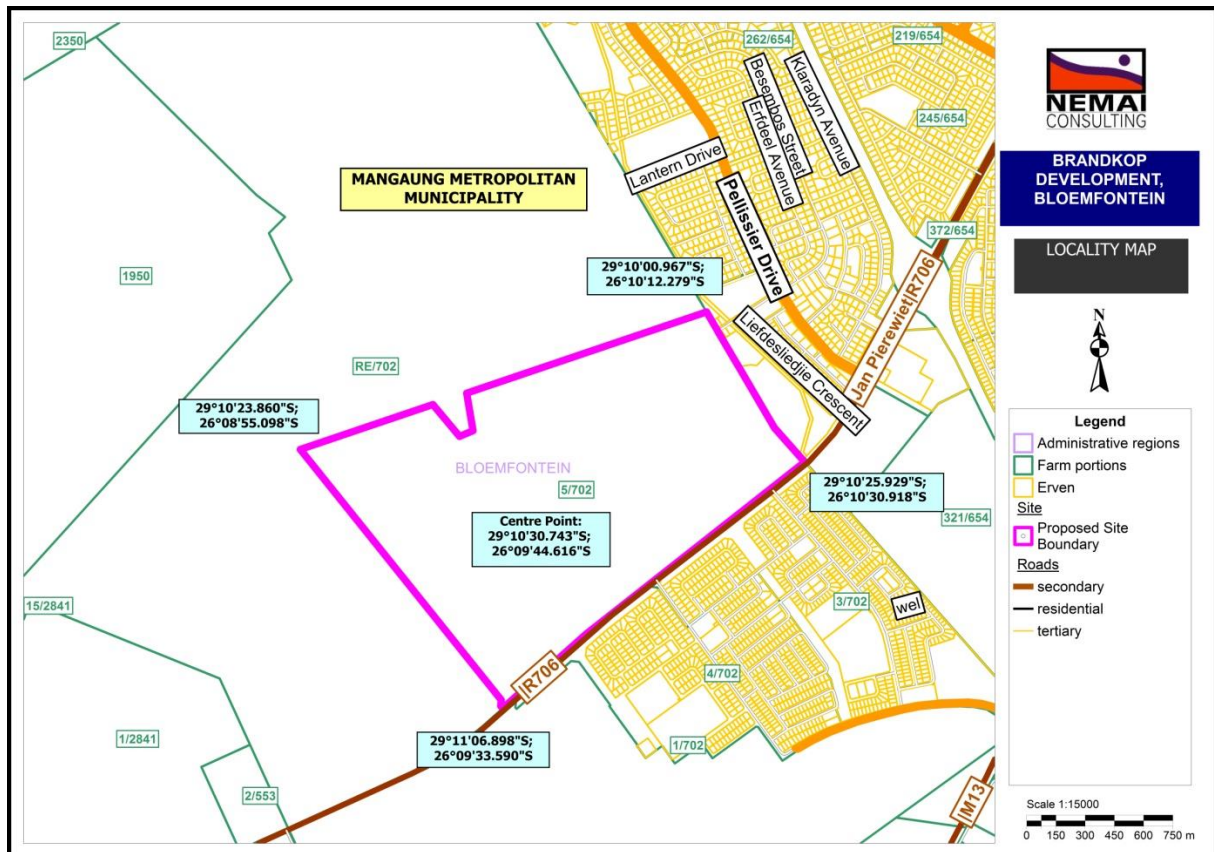


Figure 5: Cadastral Map

5.3 Location of Proposed Activities

All activities related to Brandkop Mixed-Use Development will take place in the site described in Section 5.1 and 5.2 above. All bulk services related to this project that occur outside of the proposed site boundary are not included in this application for environmental authorisation (thus this report), only the bulk services and activities within the proposed site boundary.

6 PROJECT DESCRIPTION

The proposed development involves the development of 256 hectares of land to create a mixed-use development. The aim of the proposed development is to provide residential housing units. In addition, the proposed development also makes provision for supportive land uses such as business, education and community facilities that are primarily intended to serve the residents of proposed development.

6.1 Project Components

The main project components included in the proposed Brandkop Mixed-Use Development are as follows:

- The development and construction of the Brandkop Mixed-Use Development including the following:
 - Residential units – consisting of multi-storey walk up units, gap housing and conventional housing;
 - Institutional and educational facilities;
 - Business (convenience retail and commercial) facilities;
 - Bus and taxi facilities;
 - Roads; and
 - Public open spaces (including conservation areas).
- The development, construction and operation of associated services including the following:
 - Bulk water including a 500mm diameter, 4.0 km length pipeline from Bloemwater Reservoir required to provide the bulk water to the site;
 - Bulk sewer including the construction of sewer pipelines on site and approximately 3 km of length and 500 mm diameter pipeline to transport the sewerage from Brandkop which will connect to the existing manhole with pipe of 750mm diameter which will finally drop it into the Welvaart WWTW.
 - Electrical services - The Supply Authority (Centlec) has established a 132/11kV 30MVA (FLORA DC) substation in a 80m x 80m site next to Koppie Avenue on the northern side of the development (opposite Ohlds Avenue) and are to build a second 132kV power line in parallel with the existing along the northern boundary. There is capacity in Flora DC substation with one transformer and Centlec will add another transformer of the same size as the load increases. The second phase of the development will therefore have an option to be supplied from this infrastructure (via Du Plessis DC), provided it

is in place by the time. Estimated load for the proposed development area is less than 10MVA;

- Bulk storm water will be discharged into an open line drain along the Jagersfontein road; and
- There are three categories of roads proposed: Class 2 (30m to 40m road reserve), Class 4A (20m to 30m road reserve) and Class 5B (8m to 16m road reserve).

Preliminary information regarding the proposed development and associated services are provided below.

6.1.1 Brandkop Mixed-Use Development

The main objective of the Brandkop Mixed-Use Development is to establish a sustainable mixed use, mixed income and mixed density town with capacity for between 2 490 residential units, 8 institutional stands, 6 business stands and 3 educational stands. The bulk of the development will comprise medium to higher density residential development, and supplemented with a comprehensive range of community facilities, retail, commercial and institutional facilities in the study area.

The design process includes detailed information of the site to form a base map which includes aerial photography of the area, contours, servitudes and cadastral information. This information is then used by a number of technical specialists (including Geotechnical, Roads and Storm water, Water and Sanitation and Electrical) to provide detailed information on the development requirements. These requirements are then used as structuring elements to produce a development concept and framework. This is further refined as more information is made available.

The main features of the proposed land use zones for the development (**Figure 6**) include the following:

- Conventional Housing Residential units;
- Multi-storey Walk Up Residential units;
- Gap Housing Residential units;
- Institutional facilities;
- Educational facilities;
- Business (convenience retail and commercial) facilities;
- Bus and taxi facilities;
- Roads; and
- Public open spaces (including conservation areas).

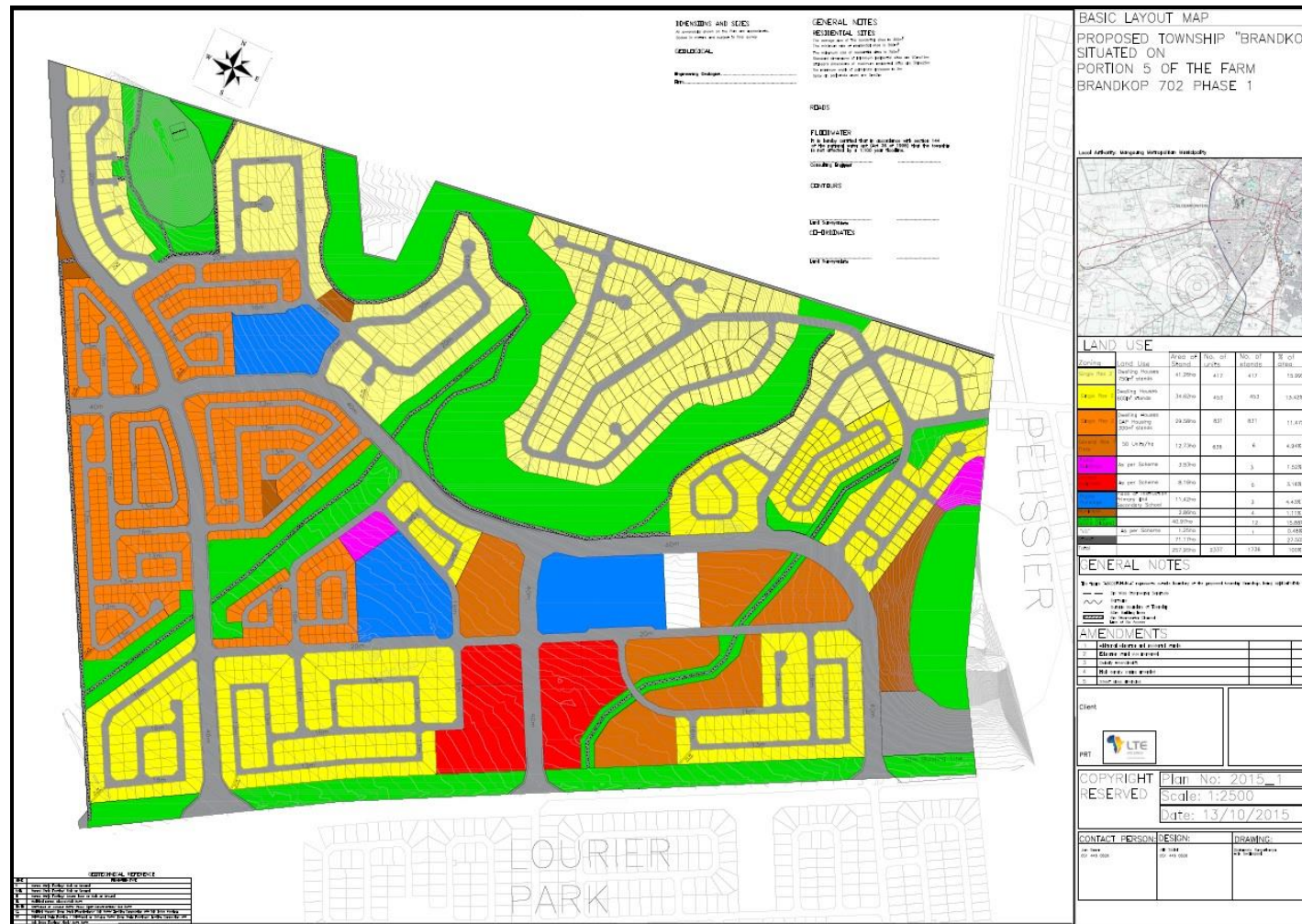


Figure 6: Proposed Layout Plan

6.1.2 Bulk Water

The development will cater for low to medium income classes. The complete water reticulation will be designed according to the standards and regulation set by the MMM. The location of Fire Hydrant and valves will be opposite the splay corner of street intersection, or opposite common boundaries between two erven. Fire Hydrant (below ground) shall also be used instead of scour and air valve and their connections will be taken from the side of the water main.

The total potable water supply for Louierpark, which is located south of the proposed site, is from an existing 600mm diameter municipal bulk pipeline located on Jagersfontein road. The level of service for water supply to this development will be the high level of service. A bulk zone meter will be installed on the main feed to the facility; a discrete supply zone will be created. The proposed connection point to the proposed development will be through the existing 600mm pipe located on the southern side of the development.

Based on the current information above (LTE Consulting 2014), a bulk water supply line would be required to supply the bulk water required to service the development. An approximately 4km length, 500mm diameter pipeline from Bloemwater Reservoir will be required to provide the bulk water of the site for the lowest level of Brandkop, and a water tower of 1ML with a pump system for the highest point. Only the portion of the bulk service that occurs inside of the proposed site boundary will be included under this application for environmental authorisation (thus this report), any proposed pipeline outside of the site boundary will have to form part of a separate EIA. However, the bulk water infrastructure to be included in this EIA includes the proposed uPVC bulk water supply line section within the Brandkop boundary.

6.1.3 Bulk Sewer

The internal sewer reticulation network is generally located on the lower side of the road/street, and will provide a street front service with individual connections to every stand. Street-front services are preferred due to their ease of maintenance. The erf connection pipe will be connected into the main sewer reticulation network by means of one of the three types of connections:

- Type 1: On Grade Connection
- Type 2: Sloping Drop Connection
- Type 3: Vertical Drop

The "Guidelines for Human Settlement Planning and Design" specifies that the velocity at peak flow should not be less than 0.7m/s. In order to comprise to this scenario, the following must be adopted:

Table 3: Minimum gradients for sewer pipelines

Sewer Diameter (mm)	Minimum Gradients
110	1:120
160	1:200
200	1:300
300	1:500

The nearest existing outfall sewer to Brandkop is a 450mm diameter pipeline which runs on the south eastern side of the proposed development. The existing outfall increases from the 450mm diameter into a 600mm diameter before it discharges into the waste water treatment plant. The spare capacity of the existing outfall sewer pipe and waste water treatment plant is still under investigation. The design pipe flow is to be 80% of the AADD with an additional allowance for storm water infiltration of 15%. The design flows for the development will be finalized once the layout plan has been approved. The estimated flow for this development is 53l/s.

Based on the current information above (LTE Consulting 2014), sewer pipelines and a pipeline of approximately 3 km of length and 500 mm diameter is required to transport the sewerage from Brandkop which will connect to the existing manhole with pipe of 750mm diameter which will finally drop it into the Welvaart WWTW. However, only the portion of the bulk service that occurs inside of the proposed site boundary will be included under this application for environmental authorisation (thus this report), any proposed pipeline outside of the site boundary will have to form part of a separate EIA.

6.1.4 Electricity

The estimated load for the proposed development area is less than 10MVA. However, the site will be supplied via 3x5MVA cables (due to the N+1 requirement stipulated by the authority) which will feed mini-substations that is located at positions currently being determined on the site plan. A ring configuration is implemented. Underground cables will be used for electrification. Bulk supply from transmission substation is being distributed to mini substations and kiosks.

These services fall below the thresholds listed in GN No. R. 544, R. 545 and R. 546 of 18 June 2010.

6.1.5 Stormwater

Bulk stormwater pipelines are proposed to drain the whole site.

Refer to **Appendix N** for the stormwater design report.

6.1.6 Roads

There are three categories of roads proposed: Class 2 (30m to 40m road reserve), Class 4A (20m to 30m road reserve) and Class 5B (8m to 16m road reserve). Access to site can be obtained from the N1 Bloemfontein through the R706 road. The proposed development has four proposed access points:

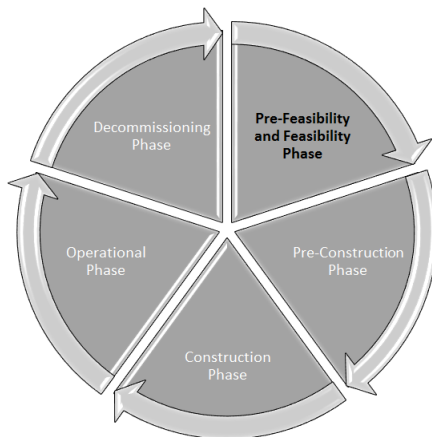
- Access 1 – Besembos Avenue;
- Access 2 – Kokerboom Avenue;
- Access 3 – Near Doringklaat Avenue; and
- Access 4 – Off R706 Road.

6.2 Project Life-Cycle

To adequately consider the impacts associated with the proposed Brandkop Mixed-Use Development, the major activities during each phase of the project life-cycle are listed in the sub-sections to follow.

6.2.1 Feasibility Studies

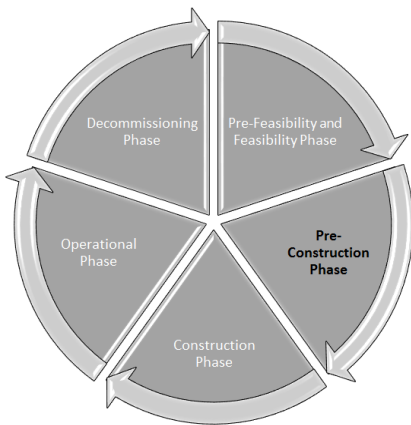
Major activities during the Pre-Feasibility and Feasibility Phases of the project include the following:



- Technical, economic and environmental screening of alternatives; and
- Geotechnical investigations to confirm soil conditions (where needed).

6.2.2 Pre-Construction

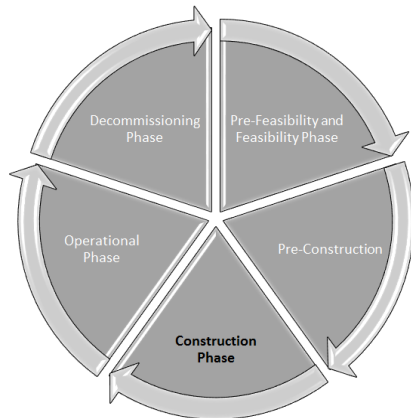
Major activities during the Pre-Construction Phase of the project include the following:



- Detailed layouts and services designs;
- Detailed geotechnical investigations;
- Obtain Environmental Authorisation;
- Procurement process for Contractors;
- Tender for various construction works; and
- Procurement of other necessary materials.

6.2.3 Construction

Major activities during the Construction Phase are as follows:



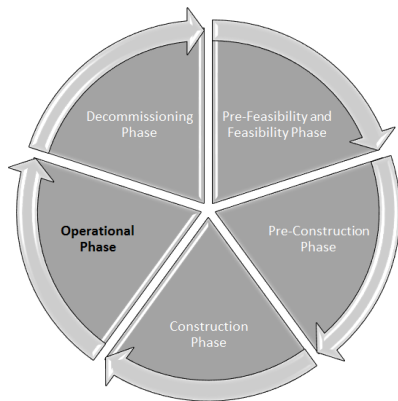
Appointments and site camp set up:

- Appoint Environmental Control Officer;
 - Set up site camp with temporary offices and administrative facilities;
 - Set up ablutions;
 - Set up access control, security; signage and lighting;
 - General materials storage and laydown areas;
- Construction of chemicals storage facilities (oil, grease, solvents etc.) and associated infrastructure (bunds, secured / roofed areas etc.);
 - Construction employment;
 - Workshops / areas (e.g. welding, mechanical repair, electrical etc.);
 - Change-houses, chemical toilets and showering facilities (linked to conservancy tanks – removal of contents by exhauster vehicle and disposal at permitted facility); and
 - Temporary waste storage areas; these shall be established and managed in accordance with the Environmental Management Programme (EMPr) requirements to be developed in the EIA phase.
 - Sourcing of construction materials and equipment:
 - All bulk materials (aggregate, cement, steel etc.) will be sourced from existing lawful commercial sources; there will be no direct mining, harvesting or extraction of natural resources;

- Excavation and earthworks:
 - Removal of existing surfacing material (concrete, asphalt etc.) which could involve excavation below ground level;
 - Levelling and compaction using heavy machinery / earthmoving equipment;
 - Potential for excavations and trenching in order to prepare foundations and laying of below ground level equipment (cables, pipes, sumps, drainage etc.);
 - Potential for excavation dewatering in the event of water-table interception;
 - Piling / drilling depending on the identified construction / founding technique; and
 - Use of general mechanical equipment within construction areas (generators, cutting and welding equipment, compressors etc.).

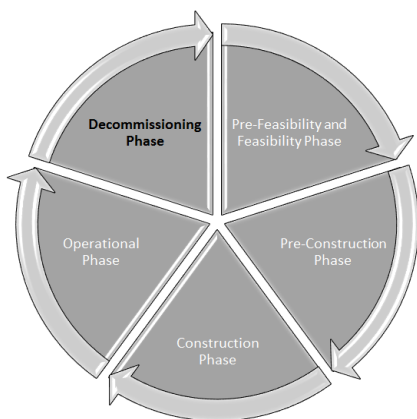
6.2.4 Operation

Major activities during the Operational Phase of the project include the following:



- Operation of the development;
- Maintenance of infrastructure; and
- On-going consultation with directly affected parties.

6.2.5 Decommissioning



Decommissioning of the Brandkop Mixed-Use Development is not envisioned. However, should decommissioning be required the activity will need to comply with the appropriate environmental legislation and best practices at that time.

7 LEGISLATION AND GUIDELINES CONSIDERED

7.1 Overview of Legislation

Some of the pertinent environmental legislation that has bearing on the proposed development is captured in **Table 4** below. More detailed information is provided in Section 7.2 to 7.16 This Section aims to satisfy 2(e) of Appendix 2 of GN No. R. 982 of 04 December 2014: A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.

Table 4: Environmental Legislative Framework

Legislation	Relevance
Constitution of the Republic of South Africa (Act No. 108 of 1996)	Chapter 2 – Bill of Rights. Section 24 – environmental rights.
National Environmental Management Act (Act No. 107 of 1998)	Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment). Section 28 – Duty of care and remediation of environmental damage. Environmental management principles. Authority – DESTEA.
GN No. R. 543 of 18 June 2010 and R. 982 of 04 December 2014 EIA Regulations	Process for undertaking Basic Assessment / Scoping and EIA process.
GNs No. R 544 and 545 of 18 June 2010 and R. 983 and 984 of 04 December 2014 EIA Regulations	Activities that need to be assessed through a Basic Assessment process.
GN No. R. 546 of 18 June 2010 and R. 985 of 04 December 2014 EIA Regulations	Activities that need to be assessed through a Scoping and EIA process.
National Water Act (Act No. 36 of 1998)	Chapter 3 – Protection of water resources. Section 19 – Prevention and remedying effects of pollution. Section 20 – Control of emergency incidents. Chapter 4 – Water use. Authority – Department of Water and Sanitation (DWS).
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes. Authority – Department of Environmental Affairs (DEA).
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	Management and conservation of the country's biodiversity.

Legislation	Relevance
	Protection of species and ecosystems. Authority – DEA.
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	Air quality management. Section 29 – pollution prevention plans (Notice 172 of 2014: Greenhouse gases as priority air pollutants) Section 32 – dust control. Section 34 – noise control. Section 35 – control of offensive odours. Authority – DEA.
National Environmental Management: Waste Act (Act No. 59 of 2008)	Chapter 4 – Waste management measures Chapter 5 – licensing requirements for listed waste activities. Authority – DEA.
Occupational Health & Safety Act (Act No. 85 of 1993)	Provisions for Occupational Health & Safety. Authority – Department of Labour.
National Heritage Resources Act (Act No. 25 of 1999)	Section 34 – protection of structure older than 60 years. Section 35 – protection of heritage resources. Section 36 – protection of graves and burial grounds. Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m ² in extent. Authority – Free State Provincial Heritage Resources Authority.
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	Control measures for erosion. Control measures for alien and invasive plant species. Authority – Department of Forestry and Fisheries (DAFF).
National Forests Act (Act No. 84 of 1998)	Section 15 – authorisation required for impacts to protected trees. Authority – DAFF.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	Permit required for borrow pits. Authority – Department of Mineral Resources (DMR).

7.1.1 Constitution of the Republic of South Africa (Act No. 108 of 1996)

The Constitution of the Republic of South Africa (Act No. 108 of 1996) is the supreme law of the land and provides amongst others the legal framework for legislation regulating coastal management in general. It also emphasises the need for co-operative governance. In addition, the Environmental clause in Section 24 of the Constitution provides that:

“Everyone has the right –

- a) to an environment which is not harmful to their health or wellbeing;*
- b) to have the environment protected for the benefit of present and future generations through reasonable legislation and other measures that:
 - I. Prevent pollution and ecological degradation;*
 - II. Promotes conservation;*
 - III. Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development”**

The Constitution provides the overarching framework for sustainable development.

7.1.2 National Environmental Management Act (Act No. 107 of 1998)

The proposed Brandkop Mixed-Use Development requires authorisation in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), and the EIA will be undertaken in accordance with the EIA Regulations (2010) as the Application for Environmental Authorisation was submitted in August 2014 prior to gazetting of the new 2014 EIA Regulations. Despite this, where possible the requirements of the new 2014 EIA Regulations will be taken into account.

Important aspects of NEMA are sustainability principles such as the “Polluter Pays” and the “Precautionary Principle” which will also be taken into account in the assessment of the impacts of the proposed development.

7.1.3 EIA Regulations (04 December 2014)

The 2010 EIA Regulations consist of the following:

- EIA procedures - Government Notice No. R. 543;
- Listing Notice 1 - Government Notice No. R. 544;
- Listing Notice 2 - Government Notice No. R. 545; and
- Listing Notice 3 - Government Notice No. R. 546.

The proposed Brandkop Mixed-Use Development triggered activities under Listing Notices 1, 2 and 3, and thus needs to be subjected to a Scoping and EIA process. The listed activities are explained in the context of the project in **Table 5**.

Table 5: EIA Listed Activities for the Brandkop Mixed-Use Development

GN	Activity	Description as per GN	Applicability to Project
GNR 544	9 (i) and (ii)	<p>The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water -</p> <p>(i) with an internal diameter of 0,36 metres or more; or</p> <p>(ii) with a peak throughput of 120 litres per second or more.</p> <p>excluding where:</p> <p>a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.</p>	<ol style="list-style-type: none"> The proposed development requires the construction of sewer pipelines, which in total are longer than 1km in length and wider than 360mm in diameter to transport the sewerage from Brandkop which will connect to a 500mm diameter sewer pipeline which will connect to the existing manhole with a pipeline of 750mm diameter and will finally deliver the sewerage into the Welvaart WWTW. The construction of uPVC bulk water supply pipeline, which is longer than 1km in length and wider than 360mm in diameter; this will be required to provide bulk water to the site. The proposed development requires the construction of bulk stormwater pipelines, which in total are longer than 1km in length and wider than 360mm to drain the whole site. The stormwater will be discharged into an open line drain along the Jagersfontein road.
	11 (vi)(x)(xi)	<p>The construction of:</p> <p>(vi) bulk storm water outlet structures;</p> <p>(x) buildings exceeding 50 square metres in size; or</p> <p>(xi) infrastructure or structures covering 50 square metres or more</p> <p>where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.</p>	<p>The proposed development requires the construction of bulk storm water outlets and may occur within 32m of a watercourse as well as construction of roads, walkways etc. The construction of infrastructure and buildings may also be required.</p>
	12	<p>The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres</p>	<p>Initially it was proposed to construct a 4 ML (4 000 m³) reservoir.</p> <p>However, this activity no longer applies and the Application Form</p>

GN	Activity	Description as per GN	Applicability to Project
		or more, unless such storage falls within the ambit of activity 19 of GN 545.	will be amended in the EIA phase.
	13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres	Initially it was thought that there may be storage of dangerous goods on the site. However, this activity no longer applies and the Application Form will be amended in the EIA phase.
	18 (i)	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 from- a watercourse	The proposed development may require excavation and removal of material from watercourses during the construction of the proposed infrastructure.
	24	The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule such land was zoned open space, conservation or had an equivalent zoning.	The proposed development includes transformation of approximately 256 hectares of land to residential, retail, commercial, industrial or institutional use. However, this activity no longer applies as the land is zoned as "undetermined" and the Application Form will be amended in the EIA phase.
	37 (a and b)	The expansion of facilities or infrastructure for the bulk transportation of water, sewage or storm water where: (a) the facility or infrastructure is expanded by more than 1000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more— excluding where such expansion: i) relates to transportation of water, sewage or storm water within a road reserve; or ii) where such expansion will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	Initially it was thought that the development would involve the expansion of bulk water, sewer and stormwater pipelines. However, this activity no longer applies and the Application Form will be amended in the EIA phase.
	39 (v)	The expansion of (v) bulk storm water outlet structures;	Initially it was thought that the development would involve the expansion of bulk storm water

GN	Activity	Description as per GN	Applicability to Project
		within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint but excluding where such expansion will occur behind the development setback line.	pipelines. However, this activity no longer applies and the Application Form will be amended in the EIA phase.
	41	The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more.	Initially it was thought that there may be a need to expand reservoirs. However, this activity no longer applies and the Application Form will be amended in the EIA phase.
	56	Phased activities for all activities listed in this Schedule, which commence on or after the effective date of this Schedule, where any one phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold	Possible phased activities that may collectively trigger this activity.
GNR 545	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;	The proposed development includes the physical alteration of the undeveloped site to a mixed use development which includes housing, commercial, recreational, institutional, retail and industrial use. The size of the development is approximately 256 hectares.
GNR 546	2(a)(iv)(aa and bb)	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres. (a) In Free State province: iv. In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, or zoned for a conservation purpose.	Initially it was proposed to construct a 4 ML (4 000 m ³) reservoir. However, this activity no longer applies and the Application Form will be amended in the EIA phase.

GN	Activity	Description as per GN	Applicability to Project
	4(a)(iii)(aa and bb)	<p>The construction of a road wider than 4 metres with a reserve less than 13,5 metres.</p> <p>(a) Free State province:</p> <p>iii. In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.</p>	<p>The proposed location of the roads may occur in an area identified as public open space or for conservation use.</p> <p>However, this activity no longer applies as the land is zoned as “undetermined” and the Application Form will be amended in the EIA phase.</p>
	16 (iii and iv) (a) (iii) (aa and bb)	<p>The construction of: (iii) buildings with a footprint exceeding 10 square metres in size; or (iv) infrastructure covering 10 square metres or more</p> <p>where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line</p> <p>(a) In Free State:</p> <p>iii. In urban areas: (aa) Areas zoned for use as public open space. (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.</p>	<p>The proposed location of the buildings and infrastructure may occur in an area identified as public open space or for conservation use.</p> <p>However, this activity no longer applies as the land is zoned as “undetermined” and the Application Form will be amended in the EIA phase.</p>

7.1.4 National Water Act (Act No. 36 of 1998)

The National Water Act (NWA) (Act No. 36 of 1998) regulates the water resource of South Africa. Water is considered a scarce commodity and should therefore be adequately protected. Amongst others, the act deals with the protection of water sources, water uses, water management strategies and catchment management, dam safety and general powers and functions. The purpose of the act is to ensure that South Africa's water resources are protected, used, developed, conserved, managed and controlled. The NWA includes the definition of a Water Resource.

The NWA definition for a Water Resource includes:

1. A Watercourse;
2. Surface Water;
3. An Estuary; and
4. An Aquifer.

The NWA defines a watercourse as follows:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse include, where relevant, its bed and banks.

The Act also specifies that a wetland is defined as 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. Section 21 of the NWA provides information on what water uses require approval, i.e. a Water Use License Application (WULA). These include:

- a) Taking water from a water resource;
- b) Storing water;
- c) Impeding or diverting the flow of water in a watercourse;
- d) Engaging in a stream flow reduction activity;
- e) Engaging in a controlled activity;
- f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- g) Disposing of waste in a manner which may detrimentally impact on a water resource;
- h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- i) Altering the bed, banks, course or characteristics of a watercourse;
- j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- k) Using water for recreational purposes.

None of the water uses above apply to the proposed Brandkop Mixed-Use Development as the Aquatic and Wetland Study identified no natural watercourses or wetlands on site.

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

The aim of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a Protected Environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

The proposed development does not occur near any formal Protected Areas according to the South African National Biodiversity Institute (SANBI).

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

The National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004) was promulgated for the management and conservation of South Africa's biodiversity through the protection of species and ecosystems and the sustainable use of indigenous biological resources.

The main implication of this act is the protection of biodiversity. The potential flora and fauna as well as the terrestrial ecosystem of the proposed site will be discussed further in Section 13 and in the Terrestrial Ecological Impact Assessment (**Appendix F1**).

7.1.7 National Environmental Management: Air Quality Act (Act No. 39 of 2004)

The National Environmental Management: Air Quality Act (NEM:AQA) (Act No. 39 of 2004) provides for the setting of national norms and standards for regulating air quality monitoring, management and control and describes specific air quality measures so as to protect the environment and human health or well-being by:

- Preventing pollution and ecological degradation; and
- Promoting sustainable development through reasonable resource use.

It also includes measures for the control of dust, noise and offensive odours that may be relevant to the construction. No Air Emissions License (AEL) will be required for the proposed Brandkop Mixed-Use Development as it falls under all thresholds.

7.1.8 The National Environmental Management Waste Act (Act No. 59 of 2008)

The National Environmental Management Waste Act (NEM:WA) (Act No. 59 of 2008) regulates waste management in order to protect the health and environment of South African citizens. This is achieved through pollution prevention, institutional arrangements and planning matters, national norms and standards and the licensing and control of waste management activities.

The latest list of waste management activities that have or are likely to have a detrimental effect (GN No. 921 of 29 November 2013) contains activities listed in Categories A and B that would require licensing from the provincial or national authorities and activities contained in Category C which would require meeting the requirements of various Norms and Standards.

No authorisation will be required in terms of the NEM:WA (Act No. 59 of 2008), as the project will not include any of the listed waste management activities.

The following should be noted with regards to waste management during the construction Phase:

- Temporary waste storage facilities will remain below the thresholds contained in the listed activities of NEM:WA; and
- The EMPr will make suitable provisions for waste management, including the storage, handling and disposal of waste.

7.1.9 Occupational Health & Safety Act (Act No. 85 of 1993)

The Occupational Health and Safety Act (Act No. 85 of 1993) provides for the health and safety of people at work as well as the health and safety of persons using plant and machinery.

This act will need to be taken into account should the proposed development be approved.

7.1.10 National Heritage Resources Act (Act No. 25 of 1999)

The National Heritage Resources Act (Act No. 25 of 1999) was promulgated for the protection of National Heritage Resources and the empowerment of civil society to conserve their heritage resources.

The proposed construction of the Brandkop Mixed-Use Development will trigger certain categories as listed below that require a Heritage Impact Assessment (HIA) in terms of Section 38 of the National Heritage Resources Act. These categories are:

- Any development or other activity which will change the character of a site
 - Exceeding 5 000 m² in extent; or
 - Involving three or more existing erven or subdivisions thereof; or
 - Involving three or more erven or divisions thereof which have been consolidated within the past five years;
 - The costs of which will exceed a sum set in terms of regulations by the South African Heritage Resources Agency (SAHRA) or a provincial heritage resources authority;
- Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

The Act also makes provision for General Protections, which apply automatically to certain categories of heritage resources such as archaeological and paleontological sites, cemeteries and graves, and structures older than 60 years.

Heritage resources in the study area will be discussed further in Section 13 and in the HIA (**Appendix F4**).

7.1.11 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983) requires the maintenance of riparian vegetation and provides a list of invasive alien vegetation that must be controlled or eradicated.

The proposed development site partly contains agricultural land. Agricultural resources in the study area will be discussed further in Section 13 and in the Agricultural Impact Assessment (**Appendix F4**).

7.1.12 National Forests Act (Act No. 84 of 1998)

In terms of the National Forests Act (Act No. 84 of 1998), trees in natural forests or protected tree species (as listed in Government Gazette Notice 1012 of 27 August 2004) may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the DAFF.

This Act has considered in the Terrestrial Ecological Impact Assessment (**Appendix F1**) in terms of the occurrence of any Protected Trees on the proposed site.

7.1.13 Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)

The Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002) sets out the requirements with which applicants for prospecting rights, mining rights and mining permits must comply in Sections 16, 22 and 27 of the MPRDA. In terms of Section 27 of the MPRDA, as amended, a mining permit applies when the mineral in question can be mined in 2 years and the area does not exceed 5 hectares. For larger areas a mining right will need to be applied for (Section 22 of MRPDA).

The proposed development will not require material from borrow pits on the site to provide infill for construction thus no Mining Permit is required.

7.2 Guidelines

- Integrated Environmental Management Information Series, in particular Series 2 – Scoping (DEAT, 2002);

-
- Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2010a);
 - Guideline on Need and Desirability, EIA Guideline and Information Document Series (DEA&DP, 2010b);
 - Integrated Environmental Management Guideline Series 5: Companion to the EIA Regulations 2010 (DEA, 2010a);
 - Integrated Environmental Management Guideline Series 7: Public Participation in the EIA Process (DEA, 2010b); and
 - Guidelines for Involving Specialists in the EIA Processes Series (Brownlie, 2005).

7.3 Regional Plans

The following regional plans were considered during the execution of the EIA (amongst others):

- Municipal Spatial Development Frameworks (SDF) (where available);
- Municipal Integrated Development Plans (IDP); and
- Relevant provincial, district and local policies, strategies, plans and programmes.

8 SCOPING AND EIA PROCESS

8.1 EIA Listed Activities (18 June 2010)

The proposed Brandkop Mixed-Use Development entails certain activities that require authorisation in terms of NEMA. Refer to Section 7 for further discussion on the legal framework.

The process for seeking authorisation is undertaken in accordance with the EIA Regulations (GN No. R. 543, R. 544, R. 545 and R. 546 of 18 June 2010), promulgated in terms of Chapter 5 of NEMA. Subsequently, the 2010 EIA Regulations were amended in 2014; however, the Brandkop Mixed-Use Development Application is in line with the 2010 EIA Regulations.

Based on the types of activities involved which include activities listed in GN No. R. 544, R. 545 and R. 546 of 18 June 2010 (see **Table 4**); the requisite environmental assessment for the project is a Scoping and EIA process.

8.2 Competent Authority

In terms of the Regulations, the lead decision-making authority for the environmental assessment is the Free State DESTEA as the project proponent is the Mangaung Metropolitan Municipality.

8.3 Application Form

An Application Form for Scoping and EIA, in terms of Regulation 26 of GN No. R. 543 of 18 June 2010, was submitted to Free State DESTEA on 26 November 2014. Acknowledgement and Acceptance of the Application was received on 04 December 2014. DESTEA assigned the following reference number to the project:

EMS/9(i)(ii),11(vi)(x)(xi),12,13,18(i),24,37(a)(b),39(v),41,56,15,2(a)(iv)(aa)(bb),4(a)(iii)(aa)(bb),16(iii)(iv)(a)(iii)(aa)(bb).

The Application Form has been amended to include the updated Listed Activities to be applied for (as some activities have fallen away over the EIA process) and this Amended Application Form will be submitted to the Free State DESTEA with the submission of the Draft EIA report (also available in **Appendix E**).

8.4 Formal Process

The environmental assessment process is divided into two phases, namely: 1) Scoping and 2) EIA. An outline of the Scoping and EIA process for the proposed Brandkop Mixed-Use Development is provided in **Figure 10**.

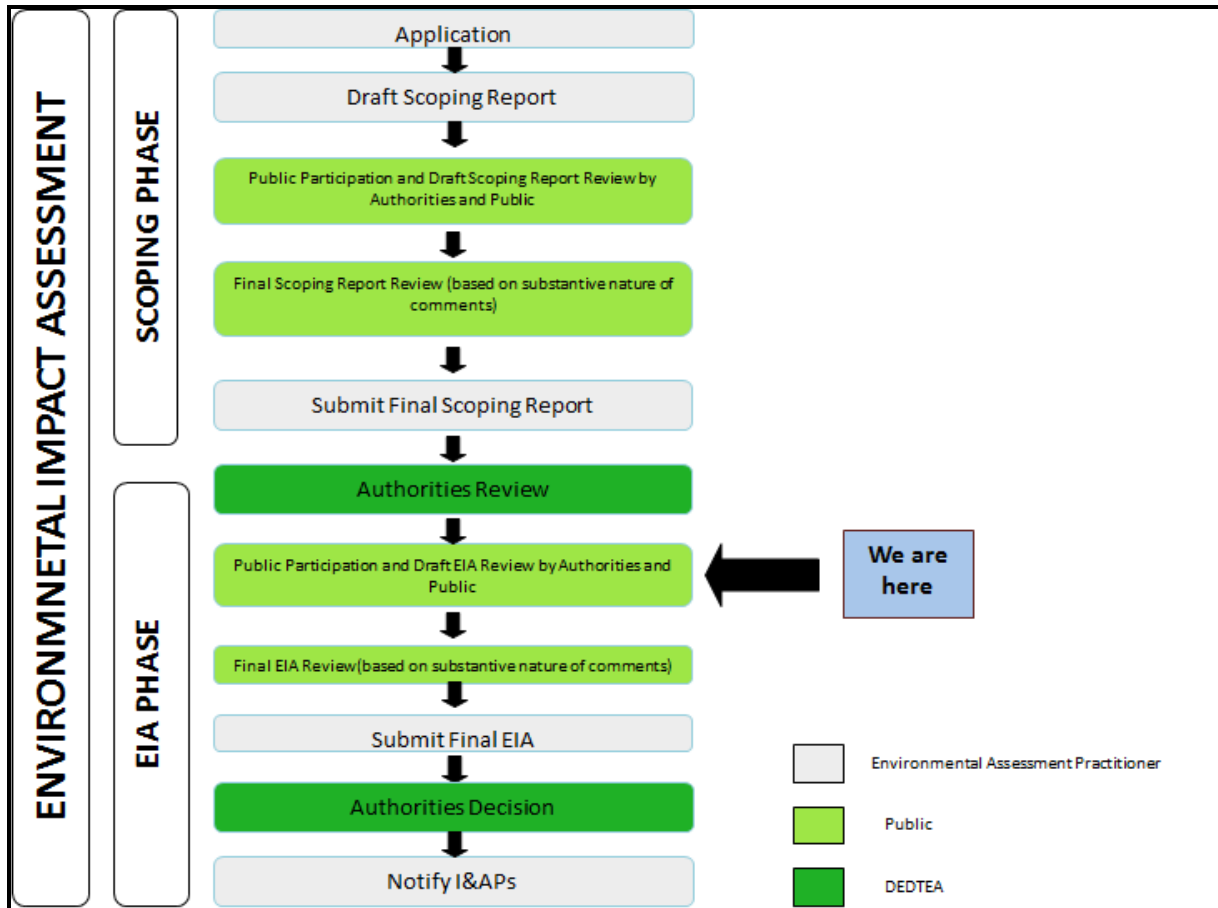


Figure 7: Scoping and EIA Process

8.5 Scoping Phase

The purpose of Scoping, which concluded the first phase of the formal EIA process, was as follows:

1. Introduce the proposed project to all IAPs;
2. Engage with IAPs to allow for participation in the process that is transparent, cooperative, informative and robust. Allow for informed decision-making with regard to the EIA process;
3. Identify the significant issues and impacts to be investigated further during the execution of the EIA phase;

4. Consider suitable and feasible alternatives for achieving the project's objectives; and
5. Determine the scope of the ensuing EIA phase in terms of specialist studies, public participation, assessment of impacts and appraisal of alternatives.

The following milestones have been reached for the Scoping Phase:

- An Application Form for Scoping and EIA, in terms of Regulation 26 of GN No. R. 543 of 18 June 2010, was submitted to DESTEA on 26 November 2014. Acknowledgement and Acceptance of the Application was received on 04 December 2014;
- The public were notified about the project in February 2015;
- A Draft Scoping Report, which conformed to regulation 28 of GN No. R. 543 (18 June 2010), was compiled. This document included the following salient information (amongst others):
 - a) A Scoping-level impact assessment to identify potentially significant environmental issues for detailed assessment during the EIA phase;
 - b) Screening and investigation of feasible alternatives to the project for further appraisal during the EIA phase; and
 - c) A Plan of Study, which explains the approach to be adopted to conduct the EIA for the proposed Brandkop Mixed-Use Development. This included inter alia the Terms of Reference for the identified Specialist Studies;
- Notification of the review period for the Draft Scoping Report was undertaken in July 2015. The Draft Scoping Report was lodged for a 30-Day public review (27 July 2015 to 27 August 2015) and for a 40-Day authority review (27 July 2015 to 07 September 2015);
- A Public Meeting was held on 13 August 2015 to present the Draft Scoping Report;
- An Environmental Authorities Meeting was also held on 13 August 2015 to provide an overview of the Draft Scoping Report;
- A Comments and Response Report was compiled (which was updated during the execution of the Scoping process), which summarised the issues raised by IAPs and the project team's response to these matters;
- DESTEA approved the Scoping Report on 25 November 2015 (**Appendix A**), which allowed the commencement of the EIA phase;
- Notification of the review period for the Final Scoping Report was undertaken October 2015. The Final Scoping Report was lodged for a 14-Day review period (23 October 2015 to 06 November 2015);
- The Final Scoping Report was submitted to DESTEA on 23 October 2015; and
- Notification of IAPs of the approval of the Scoping Report and the review of the Draft EIA Report will be undertaken as a combined exercise in May 2016.

8.6 EIA Phase

The EIA phase, which constitutes the second phase of the formal EIA process, serves to follow from the Scoping phase and will provide the following:

- A detailed description of the proposed development and location;
- A description of the environment that may be affected by the activity and the manner in which physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed development;
- The methodology of the stakeholder engagement process will be described;
- The Comments and Responses Report and Stakeholder Database will be provided as an appendix to the EIA Report;
- A description of the need and desirability of the proposed development and the identified potential alternatives to the proposed activity;
- A summary of the methodology used in determining the significance of potential impacts;
- A description and comparative assessment of the project alternatives;
- A summary of the findings of the specialist studies (Copies of all specialist reports appended to the EIA report);
- A detailed assessment of all identified potential impacts;
- A list of the assumptions, uncertainties and gaps in knowledge;
- An opinion by the consultant as to whether the development is suitable for approval within the proposed site;
- An EMP that complies with 31(2)(p) of GN No. R 543 and Appendix 4 of GN No. R. 982; and
- Any further information that will assist in decision making by the authorities.

8.6.1 Alignment with the Plan of Study

The Plan of Study, which was contained in the Scoping Report and was approved by DESTEA, explained the approach to be adopted to conduct the EIA for the proposed project. The manner in which the EIA Report addresses the requirements of the Plan of Study is shown in **Table 6**.

Table 6: Alignment of EIA Report with Plan of Study

Plan of Study Requirement	EIA Report Reference
Assess pertinent environmental issues identified during Scoping through: <ol style="list-style-type: none"> 1) Applying an appropriate impact assessment methodology; 2) Conducting specialist studies; 3) Obtaining technical input; and 	<ul style="list-style-type: none"> • Section 12; and • Section 13

Plan of Study Requirement	EIA Report Reference
4) Identifying suitable mitigation measures.	
Assessment of feasible alternatives.	<ul style="list-style-type: none"> • Section 15
Specialist studies to be completed in accordance with Terms of Reference.	<ul style="list-style-type: none"> • Section 13; and • Appendix F
Public participation to include the following: <ul style="list-style-type: none"> • Update the IAP Database; • Notification – Approval of Scoping Report; • Convene public meetings; • Compile and maintain a Comments and Response Report; • Allow for the review of the Draft EIA Report; and • Notification of DESTEA Decision. 	<ul style="list-style-type: none"> • Section 16
EIA Report to satisfy the minimum requirements stipulated in Appendix 3 of GN No. R. 982 (4 December 2014).	<ul style="list-style-type: none"> • Section 1
Authority Consultation.	<ul style="list-style-type: none"> • Section 16

8.6.2 Screening of Alternatives

Various options to meeting the project's objectives were considered during the Pre-Feasibility Study, which eventually lead to the identification of alternatives that were investigated as part of the EIA. Refer to further discussion on screened alternatives under Section 11. The "no go" option is also evaluated to understand the implications of the project not proceeding.

The feasible options are taken forward in the impact prediction (see Section 14), where the potential positive and adverse effects to the environmental features and attributes are examined further.

A comparative analysis of the alternatives from environmental (including specialist input) and technical perspectives is provided in Section 15. This includes a systematic comparison of the implications of the project options to enable the selection of a Best Practicable Environmental Option (BPEO).

8.6.3 Impact Prediction

The potential environmental impacts associated with the proposed project were identified through an appraisal of the following:

- Proposed locations and footprint of the project infrastructure and components, which included a desktop evaluation with a Geographical Information System (GIS) and aerial photography, as well as site investigations;
- Project infrastructure and design considerations;
- Activities associated with the project life-cycle (i.e. pre-construction, construction, operation and decommissioning);

- Nature and profile of the receiving environment and potential sensitive environmental features and attributes;
- Input received during public participation from IAPs;
- Findings of specialist studies;
- Legal and policy context; and
- Cumulative impacts.

The Scoping exercise aimed to identify significant environmental impacts for further consideration and prioritisation during the EIA stage. Note that “significant impacts” relate to whether the effect (i.e. change to the environmental feature / attribute) is of sufficient importance that it ought to be considered and have an influence on decision-making. During Scoping the impact prediction was executed on a qualitative level, where the main impacts were distilled by considering factors such as the nature, extent, magnitude, duration, probability and significance of the impacts.

During the EIA stage a detailed assessment is conducted to identify all impacts, which are evaluated via contributions from IAPs, the project team and requisite Specialist Studies, and through the application of the impact assessment methodology contained in Section 14.1.6. Suitable mitigation measures are proposed to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and are included in the EMPr (**Appendix G**).

9 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this EIA process:

- The GIS versions of data available for the public are assumed to be the latest information provided by the Departments (such as SANBI).
- As the design of the project components is still in the preliminary design stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change as the technical study advances;
- This Scoping and EIA is confined to the scope of works inside the proposed site boundary. The impacts from any work related to the proposed development outside of the site boundary is not included in this EIA.
- The information on the project used in this report was received by Kgato Project Management.
- Regardless of the analytical and predictive method employed to determine the potential impacts associated with the project, the impacts are only predicted on a probability basis. The accuracy of the predictions is largely dependent on the availability of environmental data and the degree of understanding of the environmental features and their related attributes.
- The Terrestrial Ecological Impact Assessment noted the following limitations (Nemai Consulting, 2015):
 - The majority of threatened plant species are seasonal and only flower during specific periods of the year. Time constraints did not allow for repeated sampling over different seasons and so desktop surveys were used to provide additional information based on the current state of the receiving environment.
 - Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage and Nemai Consulting can thus not accept responsibility for conclusions and mitigation measures made in good faith based information gathered or databases consulted at the time of the investigation.
- The Visual Impact Assessment noted the following assumptions and limitations (Axis Landscape Architects, 2015):
 - The footprints of the buildings and design of the development was not finalised;
 - The commencement date for construction is unknown. Construction will commence as soon as public participation is complete and approval is received from the relevant authorities;

- Construction activity will occur sporadically over a large area until all the facilities have been developed;
- The recreational and conservation areas will be constructed as soon as the all the areas are completed; and
- The location, size and number of the construction camps are unknown.

10 NEED AND DESIRABILITY

In terms of Regulation 31(2)(f) of GN No. R. 543 (18 June 2010) and Appendix 2 of GN No. R. 982 of 04 December 2014, this section discusses the need and desirability of the project. The format contained in the Guideline on Need and Desirability (DEA&DP, 2009) has been used in **Table 7**.

Table 7: Need and Desirability of the Brandkop Mixed-Use Development

No.	Question	Response
Need (Timing)		
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	<p>Yes. The Mangaung SDF mentions how the rural settlements are significantly dependant on the urban areas of Bloemfontein. There needs to be a link to provide infill housing with better access to the business district for these areas.</p> <p>One of the SDF concepts includes the strategic location of mixed-use economic growth by locating higher density residential environments in close proximity to employment through the development of new houses and serviced land for housing development in the underdeveloped areas that are in close proximity to the N8 corridor development. The Free State Provincial SDF mentions to ensure that new development promotes qualitative urban integration, affordable housing, and densification in a financially viable manner, without undermining existing property values.</p> <p>The MMM Integrated Development Plan (IDP) identifies that a portion of the farm Brandkop 702 is to be earmarked for neighbourhood development, subject to the developer conducting the necessary investigations regarding the availability of all required municipal services, including a comprehensive traffic impact study, investigating the traffic capacity and upgrading needs of the Curie Ave/Kolbe Ave/Pres Boshoff Street/Markgraaff Street traffic arterial and that the developer carries all costs related to the upgrading requirements to the said road that may be necessitated by development on the relevant land (MMM IDP, 2013-2014).</p>

No.	Question	Response
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	Yes, the proposed development aims to link the rural areas to the urban areas of Bloemfontein and to provide housing to the people of Bloemfontein.
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate)	Yes, provision of housing and basic services is a national priority and a priority of MMM. There is a need for housing development in the Bloemfontein area.
4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	Services are currently being considered by the technical feasibility studies.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services)?	The development is discussed in the MMM IDP. This proposed residential development (neighbourhood) would be able to satisfy the current imbalance link between the rural and urban areas.
6.	Is this project part of a national programme to address an issue of national concern or importance?	Yes, the proposed development aims to provide housing which is a key concern of the breaking New Ground (BNG) programme which was approved by Cabinet in 2011.
Desirability (Placing)		
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	Yes.
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and Spatial Development Framework (SDF) as agreed to by the relevant authorities?	No. It is not anticipated that the proposed project will contradict or be in conflict with the MMM IDP and SDF as the development is mentioned in both.
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	The impacts of the proposed activity will be assessed in the EIA Phase however, the proposed development occurs in "koppie"/ridge area.
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use	The proposed development occurs in close proximity to the urban areas such as Pellesier, as well as to rural areas such as Lourier Park.

No.	Question	Response
	on this site within its broader context).	<p>The site is located close to transport infrastructure and thus meets the requirements of the NDP.</p> <p>The site is located south-west of Bloemfontein which requires strengthening of a mixed land use development in order to enhance sustainability as identified by the Free State SDF.</p> <p>The establishment of future neighbourhood in close proximity to Bloemfontein as suggested in the MMM IDP links favourably with the proposed development.</p>
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	Refer to Section 14 for an assessment of the project's potential impacts.
12.	How will the development impact on people's health and wellbeing (e.g. i.t.o. noise, odours, visual character and sense of place, etc)?	Refer to Section 14 for an assessment of the project's potential impacts.
13.	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	Refer to Section 14 for an assessment of the project's potential impacts.
14.	Will the proposed land use result in unacceptable cumulative impacts?	Cumulative impacts are assessed in Section 14.19.

11 ALTERNATIVES

The 2010 and 2014 EIA regulations require that feasible project specific alternatives are identified (including the “do nothing” option). The Regulations define alternatives as the following:

“Different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

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

The sub-sections to follow discuss the project alternatives considered during the Scoping process. The EIA process will provide a detailed comparative analysis of feasible alternatives from environmental (including specialist input) and technical perspectives.

By conducting the comparative analysis, the BPEO can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that *“provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term”*.

In terms of the 2010 EIA regulations under NEMA, the cardinal activity of the Scoping exercise is the consideration of viable and reasonable alternative sites, processes, and technologies of achieving the objectives of the project. The aim of this comparative environmental analysis is to make the necessary environmental input in the decision making processes in selecting a site that is environmental sustainable, socially acceptable, and economically viable for the location of the development.

Layout/Design alternatives have been deemed the most suitable for this proposed development as they allow for the most input from specialists. Two layout alternatives are assessed in the sections to follow. Detailed A3 Layout plans are provided in **Appendix D**. Smaller site layouts will be provided below to provide a general understanding of the alternatives.

11.1 Layout Alternative 1 (Proposed)

Refer to **Figure 8**. Parts of the ridges will be developed; however, the slopes of the ridges will remain undeveloped and have been zoned as Public Open Space in the design. The developments within the ridge areas (the light yellow colour in **Figure 8**) will consist of residential units that cover a large area but have a small density (higher income houses).

11.2 Layout Alternative 2

Refer to **Figure 9**. The major difference in this layout compared to alternative 1 is the positioning of roads and housing. No access was provided on this layout to the open areas (ridge areas). No Municipal properties were provided for in this layout. No Drop off zones were provided for in this layout for schools. More gap housing was provided for in this layout.

11.3 No-go alternative

The 'no-go' alternative refers to a situation where the proposed Brandkop Mixed-Use Development is not built. This would mean that the area where the proposed development is located would not change in any way and that the environmental conditions would generally stay the same.

The main implication of the No Go Option is that should the development not proceed, there will be a lack of housing and business opportunities available in the Bloemfontein area which will negatively impact the community in the area. In addition, there will be a number of socio-economic opportunities which are lost including the loss of the potential employment benefits in the local community as well as a loss of the injection of funds into the area through construction.

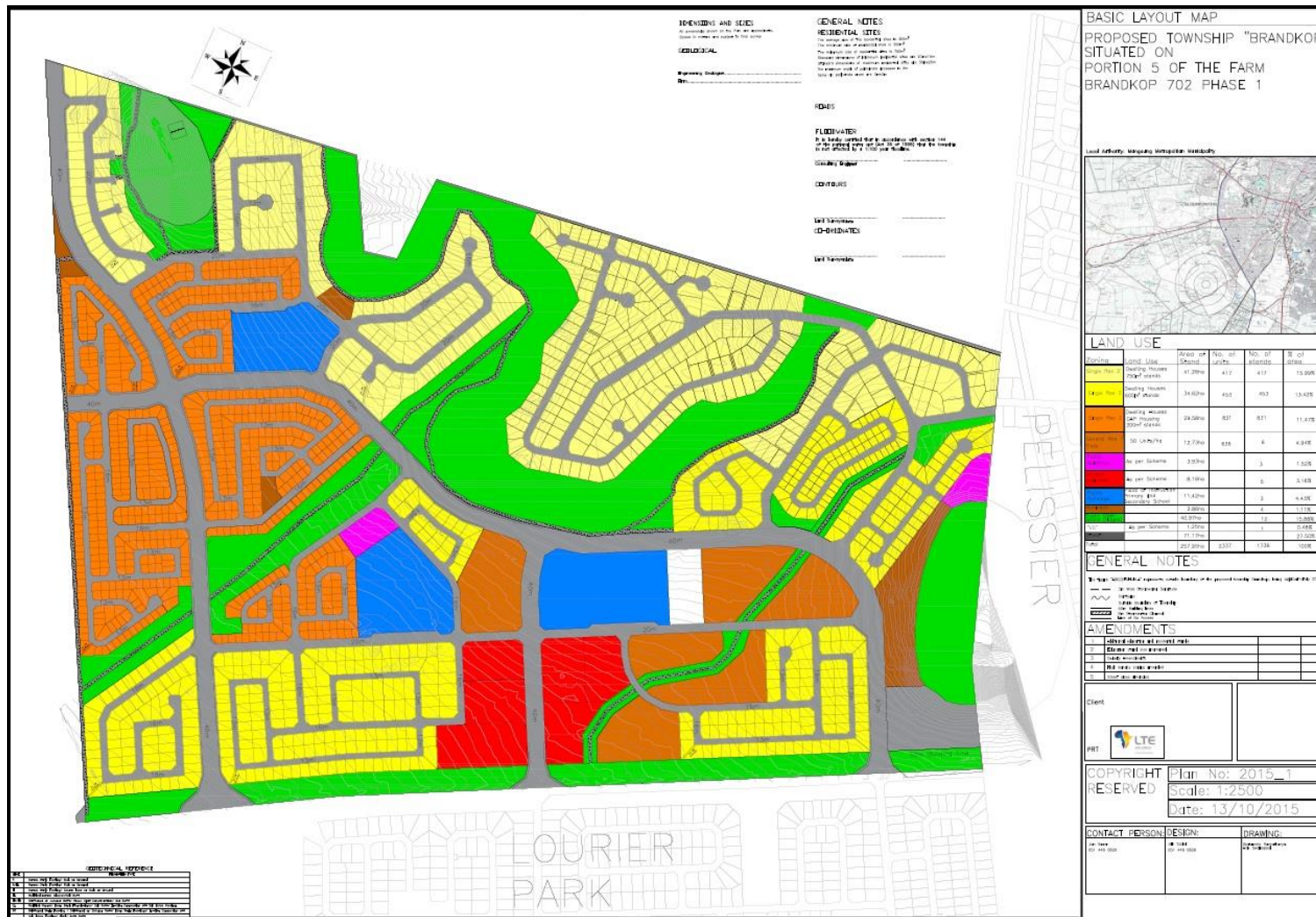


Figure 8: Alternative 1 (Proposed)

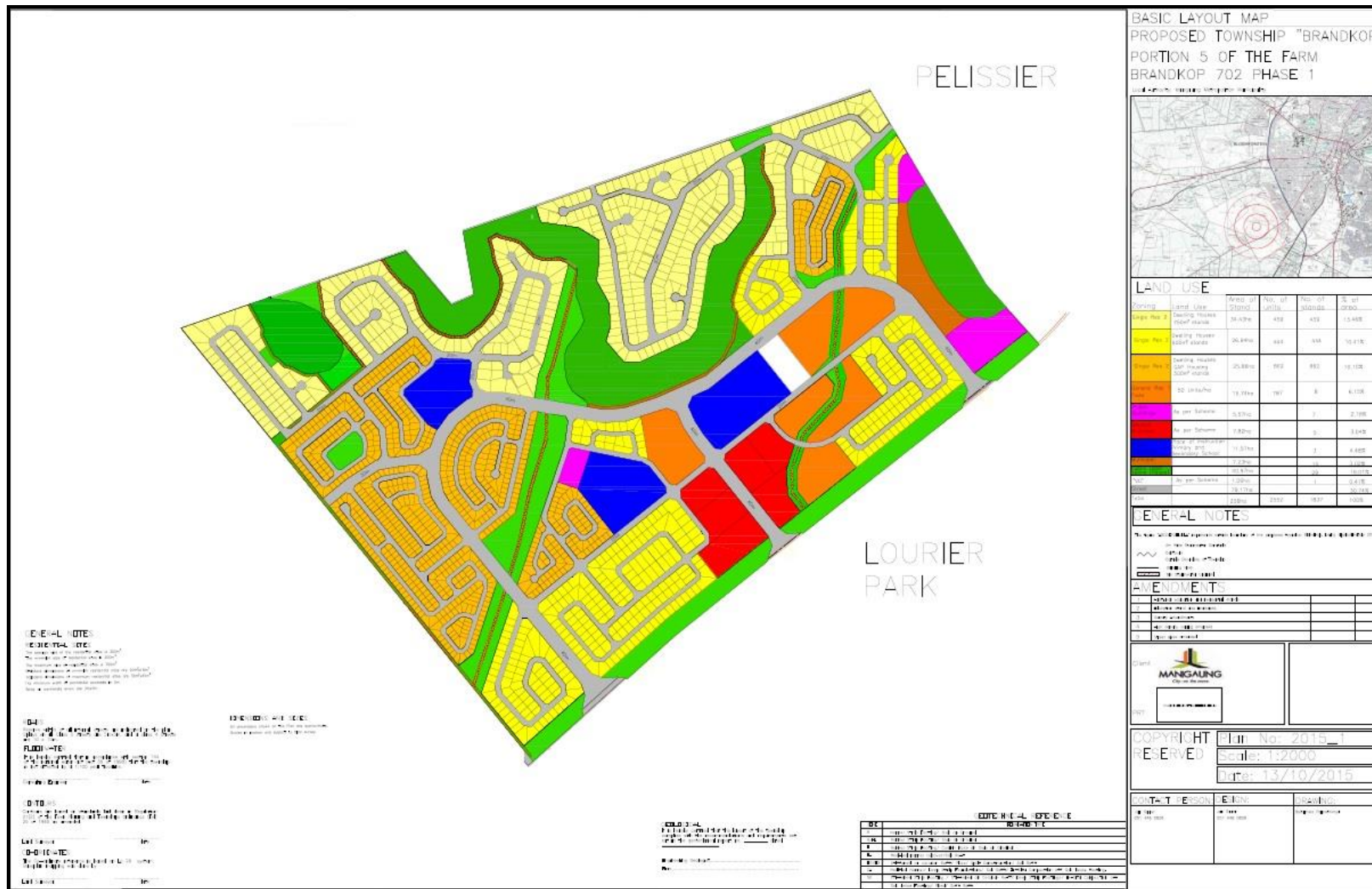


Figure 9: Alternative 2

12 PROFILE OF THE RECEIVING ENVIRONMENT

This section provides a general description of the status quo of the receiving environment in the project area. This serves to provide the context within which the EIA was conducted. It also allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed Brandkop Mixed-Use Development.

Where necessary, the regional context of the environmental features is also explained, with an ensuing focus on the local surrounding environment. Refer to Section 13 for more elaborate explanations of the Specialist Studies and their findings for specific environmental features.

This section allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. The potential impacts to the receiving environment are discussed further in Section 14.

The following environmental features have been considered:

18. Climate
19. Geology
20. Topography
21. Surface Water
22. Flora
23. Fauna
24. Land Capability
25. Heritage
26. Air Quality
27. Noise
28. Planning
29. Infrastructure
30. Availability of Services
31. Access Roads
32. Waste Management
33. Visual Aesthetics
34. Socio-Economic Environment

12.1 Climate

The site falls within the Bloemfontein region and thus the temperature and rainfall variables are discussed below. On average, the warmest month(s) are January, February and

December (**Figure 10**). Bloemfontein has dry periods in May, June, July, August, September and October (**Figure 11**).

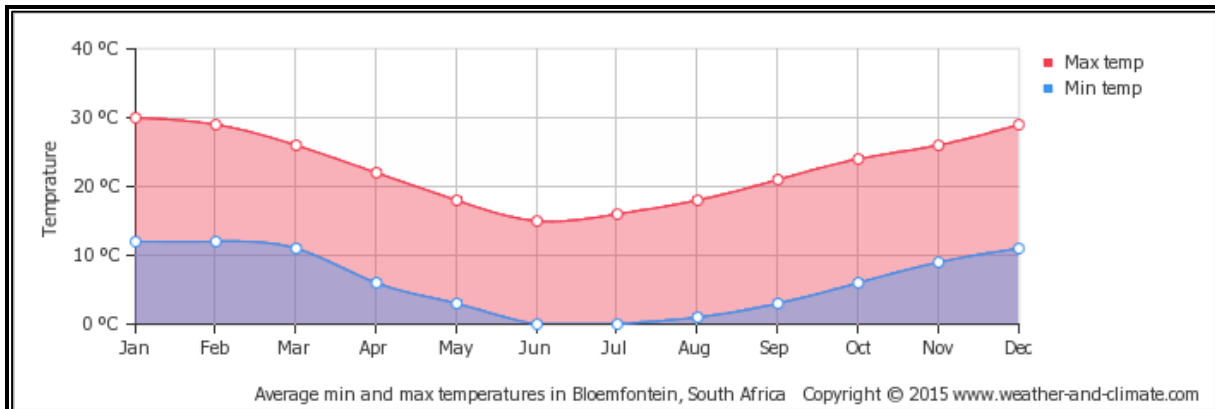


Figure 10: Average minimum and maximum temperatures in Bloemfontein (Copyright© 2015 www.weather-and-climate.com)

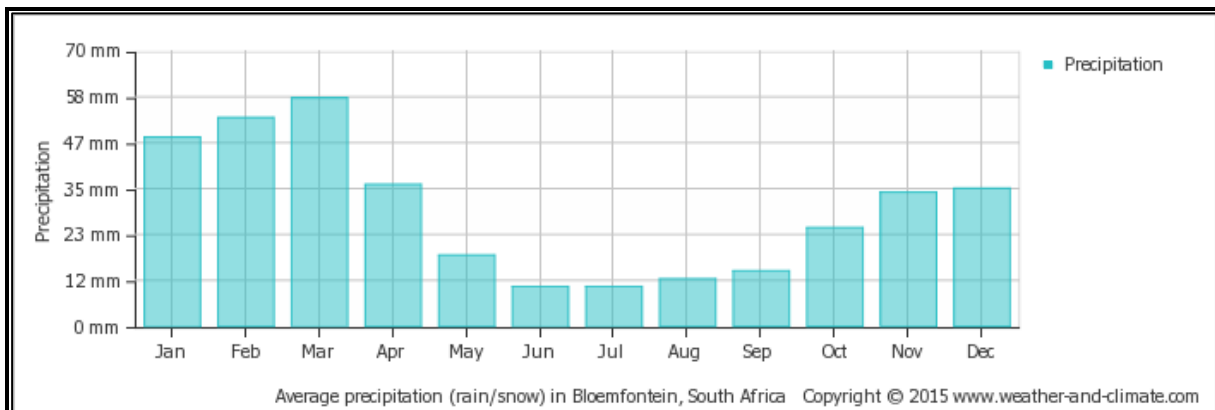


Figure 11: Average precipitation in Bloemfontein (Copyright© 2015 www.weather-and-climate.com)

12.2 Geology

The site is underlain by Beaufort Group sedimentary bedrock, comprising siltstones, mudstones and sandstones of the Adelaide Subgroup, along with the colluvial and residual material derived therefrom. The sedimentary bedrock has been intruded by Jurassic aged dolerite of the Karoo Igneous Province which presents as dykes and sills which cap the three koppies occurring on site.

The Adelaide Subgroup geology comprising intercalated siltstones, mudstones and sandstones are generally constrained to the level areas and the bases of the aforementioned koppies. In general, deeply weathered and re-worked profiles are observed along the level areas with moderately to shallow bedrock in the vicinity of the koppies.

The Jurassic aged Karoo dolerites are for the most part present as a capping to the koppies. The dolerite bedrock, on these koppies, was very shallow in nature with large portions of surface outcrop being present as well as a high surface boulder content. In addition, little top soil and residual material is present. Although not intersected within the inspection pits, dolerite intrusions are likely to be present along the level areas within the Adelaide Formation residual soils and bedrock.

No groundwater seepage was encountered during the field investigation due to the lack of considerable rainfall for some time prior to the investigation. Previous surface water ponding was evident at various locations on site due to natural and man-made shallow furrows draining the flat lying topography as well as the presence of two small earthen banks intended on damming surface water during periods of rainfall. The highly mottled nature of some of the residual soils as well as the presence of ferruginised grains indicates that groundwater seepage is likely during prolonged periods of rainfall in the form of perched groundwater tables overlying less permeable clays or at the soil rock interface.

12.3 Topography

The terrain morphology of the project area is mostly flat with few undulating plains (**Figures 12 and 13**). The particularly steep areas are the rocky “koppies”/ridges.



Figure 12: Photographs of the terrain morphology at the project site

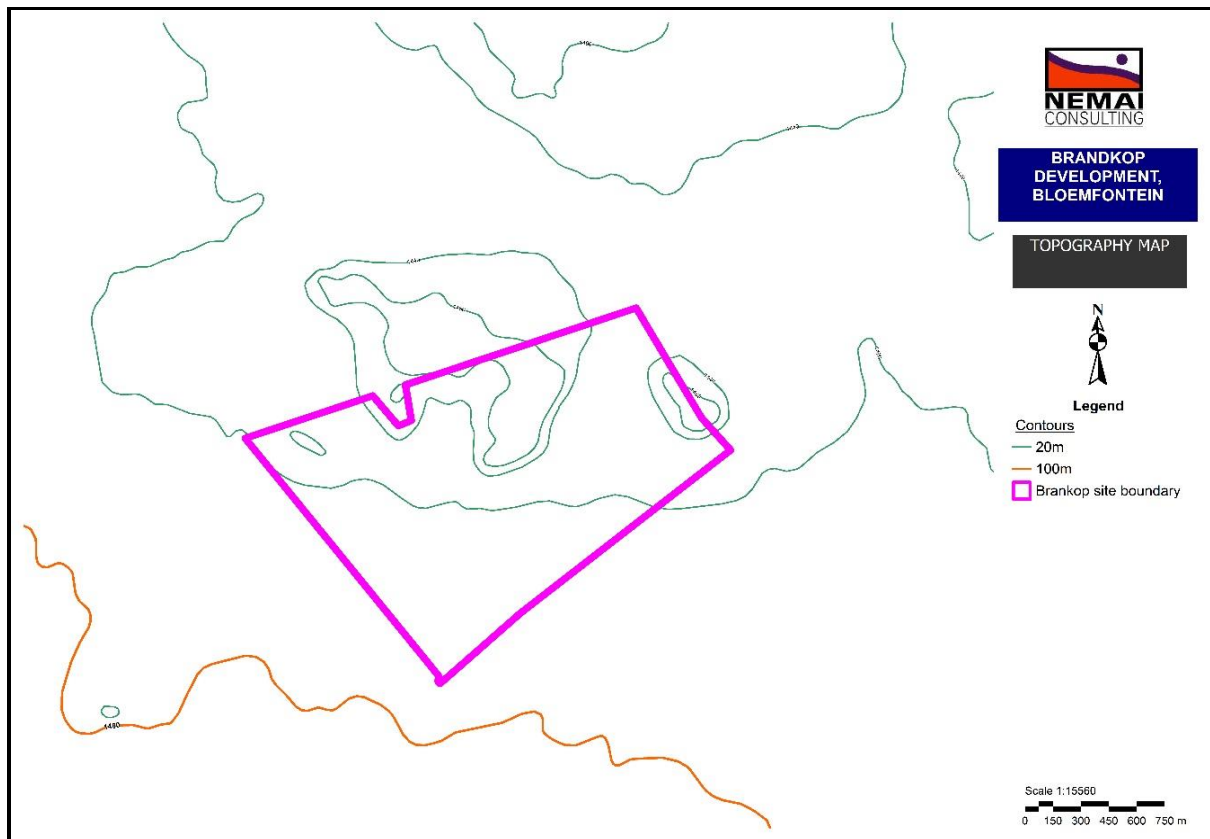


Figure 13: Contour Map

12.4 Surface Water

The site is located within the Upper Orange Management Area (WMA) and falls within the C52J quaternary catchment (**Figure 14**). The Upper Orange WMA lies predominantly within the Free State, but also occupies portions of the Eastern and Northern Cape Provinces. It borders on Lesotho in the east as well as on six other WMAs. This WMA includes the following major rivers: the Modder River, Riet River, Caledon River and Orange River. The Orange River, which rises in the eastern highlands of Lesotho where it is known as the Senqu River, is the main river in the WMA and is also the largest and longest river in South Africa. From the Upper Orange WMA, the river flows through the Lower Orange WMA where it discharges into the Atlantic Ocean some 2 300 km from its origin in Lesotho. The Caledon River, which forms the border between South Africa and Lesotho over most of its length, is the largest tributary to the Orange River within the Upper Orange WMA. Other sizeable tributaries are the Kraai and Riet Rivers. The Riet River, however, first flows into the Vaal River, which then joins the Orange River a short distance further downstream.

In terms of surface water at the site, there are no natural wetlands or riparian features on the site (**Figure 15**). A number of dams occur north of the site, and one dam occurs on the site

(Figures 16 and 17). However, a site visit confirmed that there are drainage line features (Figure 18) and wetland-like vegetation (Figure 19) on the site which may be artificial hence explaining why they do not appear on the topographical map.

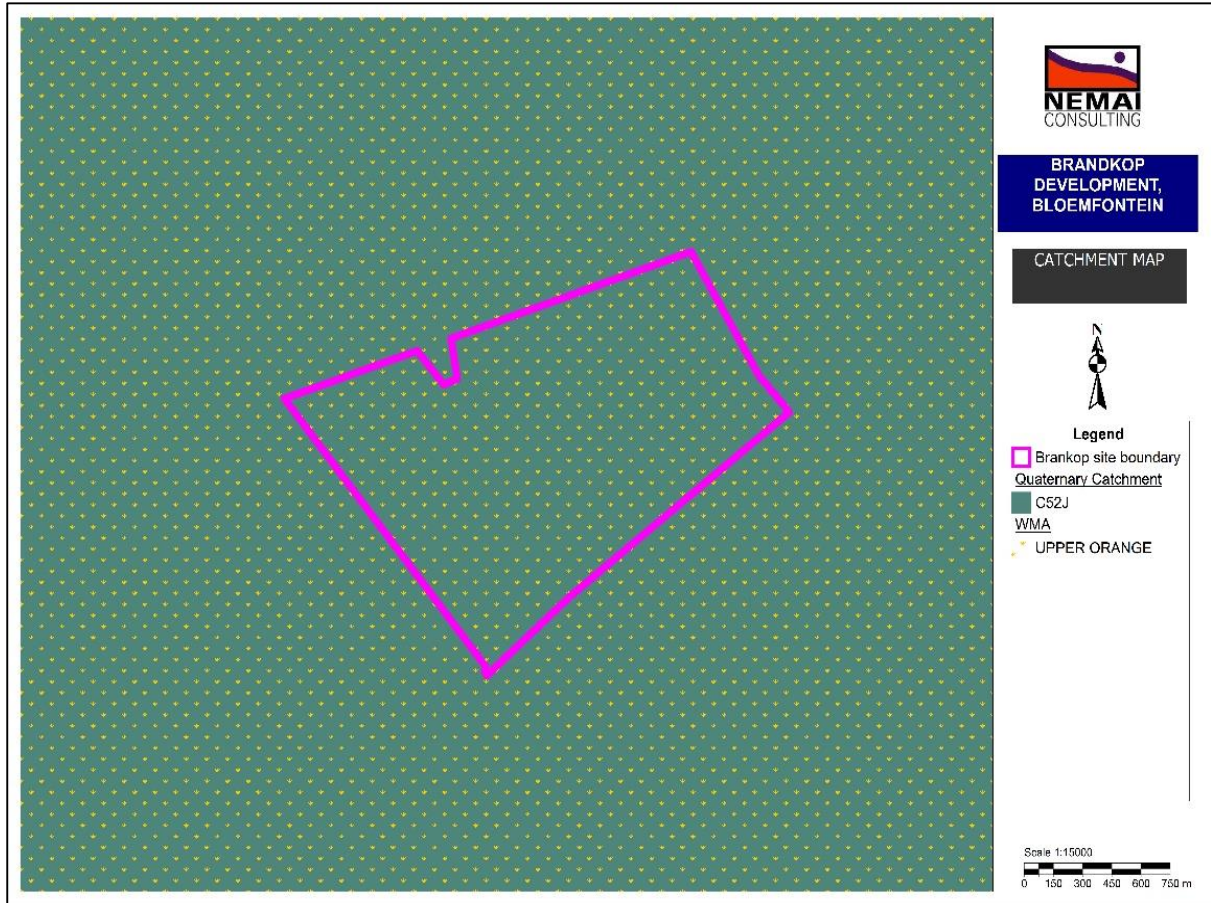


Figure 14: Catchment Details

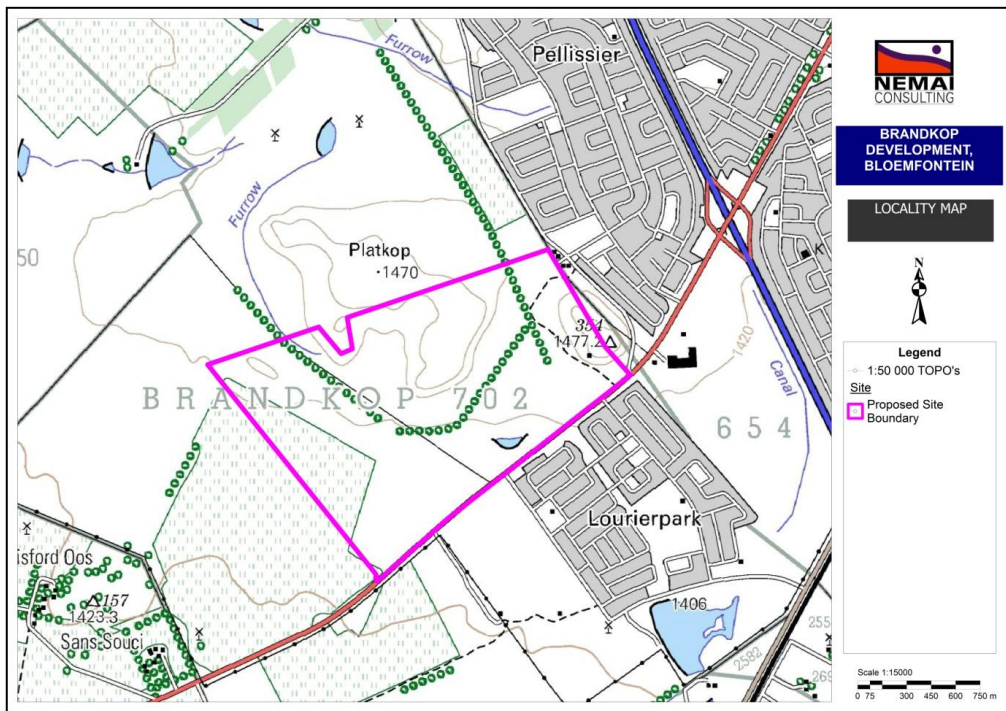


Figure 15: Topographical Map showing watercourse features

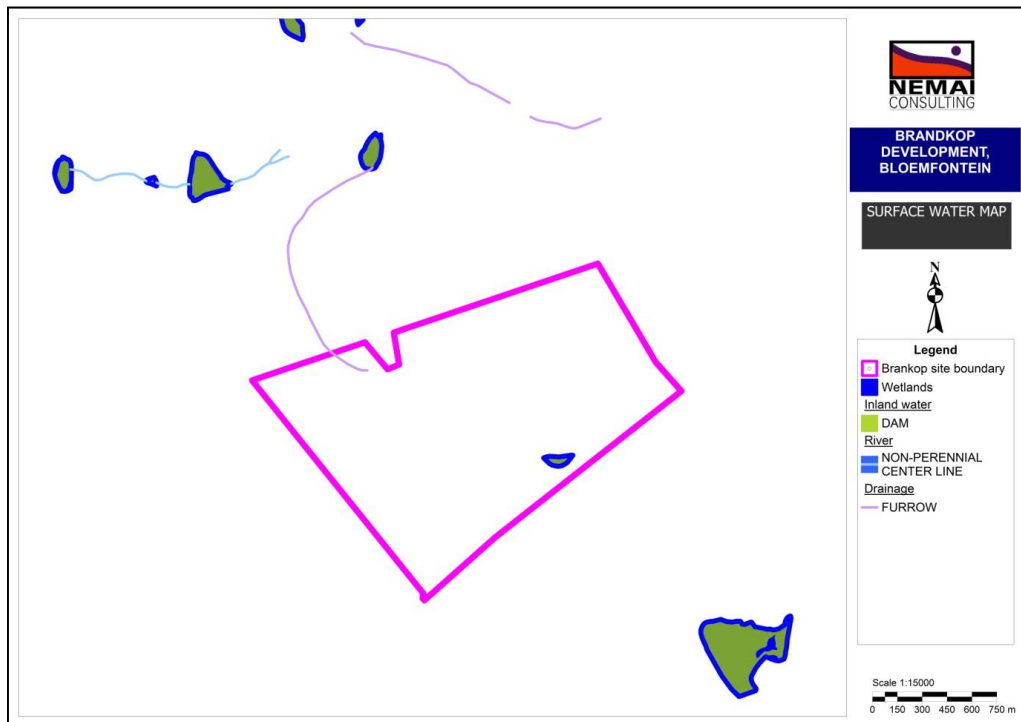


Figure 16: Surface Water



Figure 17: Photograph of the dam feature on site



Figure 18: Photographs showing the drainage line features on site



Figure 19: Photographs showing the wetland-like vegetation on site

12.5 Flora

12.5.1 Biome and Vegetation

The site falls within the Grassland Biome and is characterised by Bloemfontein Dry Grassland (**Figures 20 and 21**). It occurs in south-central part of the province, with Bloemfontein more or less centrally. It extends from Petrusburg in the west to the Rustfontein Dam in the east and from Reddersburg in the south to the Soetdoring Nature Reserve in the north.

The conservation status of this grassland type is Endangered, with a conservation target of 24%. Only a small portion of this vegetation unit is statutorily conserved in the Soetdoring Nature Reserve. More than 40% is already transformed, e.g. for crop production as well as by urban (and related) development. Especially those grasslands on shallow gravelly soils as well as the low-lying areas on clayey soils are prone to karoo-bush encroachment when overgrazed (Mucina & Rutherford 2006).

However, even though the GIS data identifies the vegetation of the site as Endangered, a site visit confirmed that the site has a high level of disturbance (**Figure 22**).

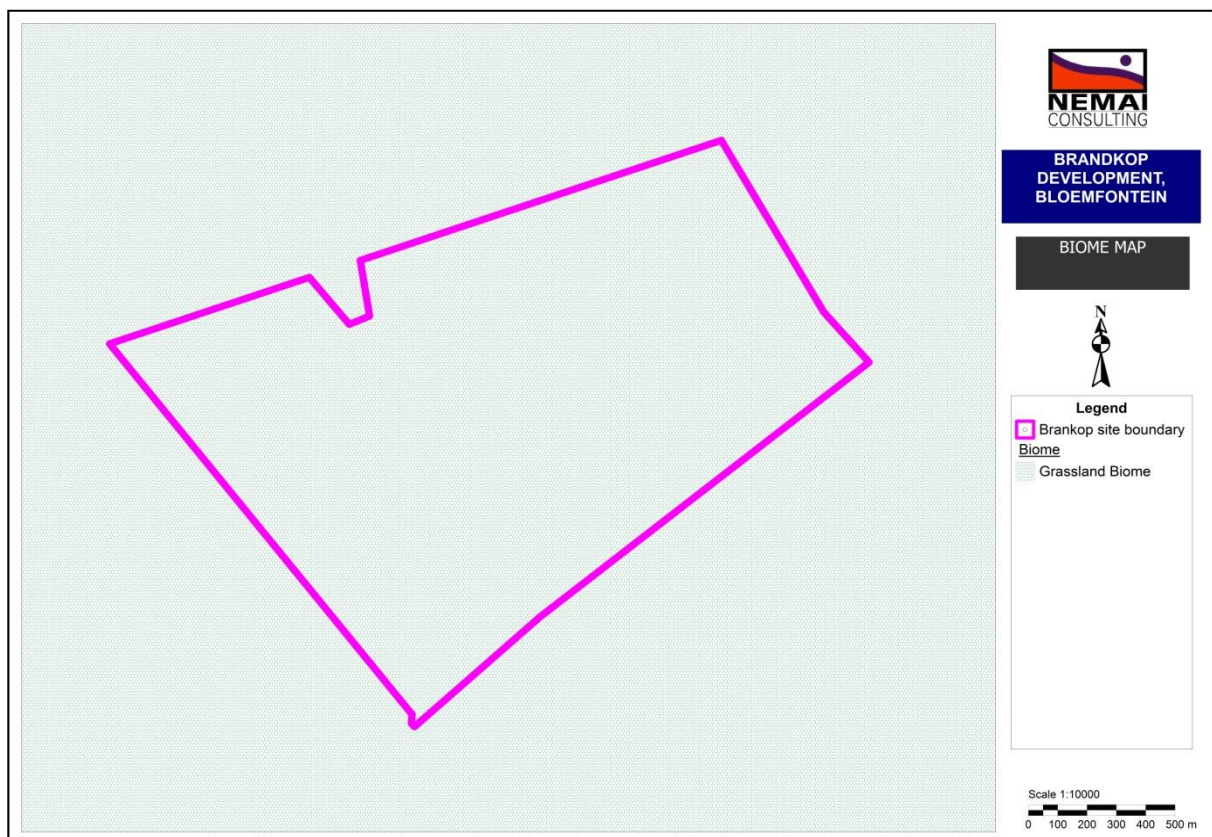


Figure 20: Biome

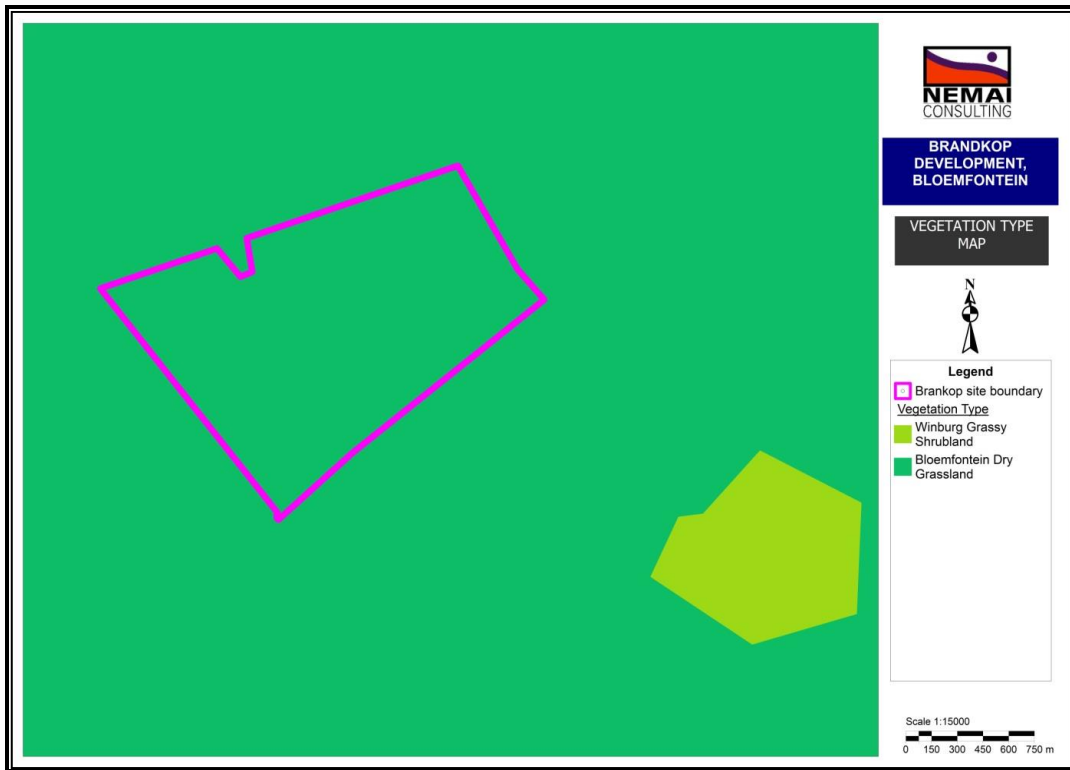


Figure 21: Vegetation Type



Figure 22: Photograph showing the level of disturbance of the site

12.5.2 Terrestrial Threatened Ecosystems

The SANBI, in conjunction with the Department of Environmental Affairs (DEA), released a draft report in 2009 entitled “Threatened Ecosystems in South Africa: Descriptions and Maps”, to provide background information on the above List of Threatened Ecosystems (SANBI, 2009). The purpose of this report was to present a detailed description of each of South Africa’s ecosystems and to determine their status using a credible and practical set of criteria. The following criteria were used in determining the status of threatened ecosystems:

- Irreversible loss of natural habitat;
- Ecosystem degradation and loss of integrity;
- Limited extent and imminent threat;
- Threatened plant species associations;
- Threatened animal species associations; and
- Priority areas for meeting explicit biodiversity targets as defined in a systematic conservation plan.

In terms of section 52(1) (a), of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), a national list of ecosystems that are threatened and in need of protection was gazetted on 9 December 2011 (Government Notice 1002). The list classified all threatened or protected ecosystems in South Africa in terms of four categories; Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Protected. The purpose of categorising these ecosystems is to prioritise conservation areas in order to reduce the rates of ecosystem and species extinction, as well as preventing further degradation and loss of structure, function, and composition of these ecosystems.

The site falls within the Bloemfontein Dry Grassland Threatened ecosystem (**Figure 23**). This ecosystem is listed as Vulnerable.

However, even though the GIS data identifies the terrestrial ecosystem of the site as Vulnerable, a site visit confirmed that the site has a high level of disturbance.



Figure 23: Threatened Ecosystems

12.5.3 Ridges

The Free State DESTEA is currently still compiling a Conservation Plan for the province that identifies sensitive terrestrial areas. Therefore this information is not available to the public yet; however, it was confirmed with the Environmental unit at DESTEA that a preliminary analysis on the proposed development indicates no Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) occur within the site; however, areas of the site are partly located on a ridge area which is classified as sensitive due to a number of important species occurring at the site as well as providing ecological connectivity between habitats as a corridor (**Figure 24**).



Figure 24: Photographs of the ridges / "koppes" on the site

12.5.4 Plant Species of Conservation Concern

The proposed development is located within the 2926AA Quarter Degree Squares (QDS) in terms of the 1:50 000 grid of South Africa. The Pretoria Computerised Information System (PRECIS) list of Red Data plants was obtained from SANBI (<http://posa.sanbi.org/searchspp.php>).

The list was consulted to verify the record of occurrence of the plant species seen in the vicinity of the proposed development. The site sampled is also only a very small portion of the whole grid and so habitats suitable for certain species in the PRECIS list may not be present at the areas sampled. Only one threatened plant species was found to occur in the QDS and is provided in the **Table 8** below.

Table 8: Red Data List Species occurring in the 2926AA QDS in which the Site Occurs

Species	Common Name	Threat Status	Description
<i>Hypoxis hemerocallidea</i> Fisch., C.A.Mey. & Avé-Lall.	African Potato / Star Flower	Declining	A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population.

12.6 Fauna

12.6.1 Mammals

A number of mammal species are known to occur in the QDS around the site (ADU, 2015) (**Table 9**). According to this list, African White-tailed Rat, African Straw-coloured Fruit Bat and Welwitsch's Myotis are the three mammal species of conservation importance known to occur in the region.

Table 9: Mammal species recorded in the grid cell 2926AA (ADU, 2015), which could potentially occur on the proposed development site

Family	Genus	Species	Common name
Bathyergidae	<i>Cryptomys</i>	<i>hottentotus</i>	Southern African Mole-rat
Bovidae	<i>Redunca</i>	<i>arundinum</i>	Southern Reedbuck
Herpestidae	<i>Cynictis</i>	<i>penicillata</i>	Yellow Mongoose
Herpestidae	<i>Galerella</i>	<i>pulverulenta</i>	Cape Gray Mongoose
Macroscelididae	<i>Elephantulus</i>	<i>myurus</i>	Eastern Rock Elephant Shrew
Molossidae	<i>Tadarida</i>	<i>aegyptiaca</i>	Egyptian Free-tailed Bat
Muridae	<i>Aethomys</i>	<i>namaquensis</i>	Namaqua Rock Mouse

Family	Genus	Species	Common name
Muridae	<i>Desmodillus</i>	<i>auricularis</i>	Cape Short-tailed Gerbil
Muridae	<i>Mastomys</i>	<i>coucha</i>	Southern African Mastomys
Muridae	<i>Mus</i>	<i>minutoides</i>	Southern African Pygmy Mouse
Muridae	<i>Otomys</i>	<i>auratus</i>	Southern African Vlei Rat
Muridae	<i>Rhabdomys</i>	<i>pumilio</i>	Xeric Four-striped Grass Rat
Muridae	<i>Tatera</i>	<i>brantsii</i>	Highveld Gerbil
Nesomyidae	<i>Dendromus</i>	<i>melanotis</i>	Gray African Climbing Mouse
Nesomyidae	<i>Mystromys</i>	<i>albicaudatus</i>	African White-tailed Rat
Nesomyidae	<i>Saccostomus</i>	<i>campestris</i>	Southern African Pouched Mouse
Nycteridae	<i>Nycteris</i>	<i>thebaica</i>	Egyptian Slit-faced Bat
Pedetidae	<i>Pedetes</i>	<i>capensis</i>	South African Spring Hare
Procaviidae	<i>Procavia</i>	<i>capensis</i>	Rock Hyrax
Pteropodidae	<i>Eidolon</i>	<i>helvum</i>	African Straw-colored Fruit Bat
Sciuridae	<i>Xerus</i>	<i>inauris</i>	South African Ground Squirrel
Vespertilionidae	<i>Myotis</i>	<i>welwitschii</i>	Welwitsch's Myotis
Vespertilionidae	<i>Neoromicia</i>	<i>capensis</i>	Cape Serotine

12.6.2 Reptiles

Table 10 provides a list of reptile species known to occur in the QDS around the site. A number of endemic species are included.

Table 10: Reptile species recorded in grid cells 2926AA which could occur in the study area (ADU, 2015)

Genus	Species	Common name	Red list category	Atlas region endemic
<i>Agama</i>	<i>aculeata</i>	Distant's Ground Agama	Least Concern (SARCA 2014)	Yes
<i>Agama</i>	<i>atra</i>	Southern Rock Agama	Least Concern (SARCA 2014)	
<i>Monopeltis</i>	<i>capensis</i>	Cape Worm Lizard	Least Concern (SARCA 2014)	
<i>Aparallactus</i>	<i>capensis</i>	Black-headed Centipede-eater	Least Concern (SARCA 2014)	
<i>Atractaspis</i>	<i>bibronii</i>	Bibron's Stiletto Snake	Least Concern (SARCA 2014)	
<i>Homoroselaps</i>	<i>dorsalis</i>	Striped Harlequin Snake	Near Threatened (SARCA 2014)	Yes
<i>Xenocalamus</i>	<i>bicolor</i>	Bicoloured Quill-snouted Snake	Least Concern (SARCA 2014)	
<i>Bradypodion</i>	<i>ventrale</i>	Eastern Cape Dwarf	Least Concern	Yes

Genus	Species	Common name	Red list category	Atlas region endemic
		Chameleon	(SARCA 2014)	
<i>Boaedon</i>	<i>capensis</i>	Brown House Snake	Least Concern (SARCA 2014)	
<i>Crotaphopeltis</i>	<i>hotamboeia</i>	Red-lipped Snake	Least Concern (SARCA 2014)	
<i>Dasypeltis</i>	<i>scabra</i>	Rhombic Egg-eater	Least Concern (SARCA 2014)	
<i>Duberria</i>	<i>lutrix</i>	South African Slug-eater	Least Concern (SARCA 2014)	Yes
<i>Lamprophis</i>	<i>aurora</i>	Aurora House Snake	Least Concern (SARCA 2014)	Yes
<i>Lycodonomorphus</i>	<i>rufulus</i>	Brown Water Snake	Least Concern (SARCA 2014)	
<i>Lycophidion</i>	<i>capense</i>	Cape Wolf Snake	Least Concern (SARCA 2014)	
<i>Prosymna</i>	<i>sundevallii</i>	Sundevall's Shovel-snout	Least Concern (SARCA 2014)	
<i>Psammophis</i>	<i>notostictus</i>	Karoo Sand Snake	Least Concern (SARCA 2014)	
<i>Psammophis</i>	<i>trinasalis</i>	Fork-marked Sand Snake	Least Concern (SARCA 2014)	
<i>Psammophylax</i>	<i>rhombeatus</i>	Spotted Grass Snake	Least Concern (SARCA 2014)	
<i>Psammophylax</i>	<i>tritaeniatus</i>	Striped Grass Snake	Least Concern (SARCA 2014)	
<i>Pseudaspis</i>	<i>cana</i>	Mole Snake	Least Concern (SARCA 2014)	
<i>Karusasaurus</i>	<i>polyzonus</i>	Karoo Girdled Lizard	Least Concern (SARCA 2014)	
<i>Elapsoidea</i>	<i>sundevallii</i>	Highveld Garter Snake	Not listed	
<i>Hemachatus</i>	<i>haemachatus</i>	Rinkhals	Least Concern (SARCA 2014)	
<i>Naja</i>	<i>nivea</i>	Cape Cobra	Least Concern (SARCA 2014)	
<i>Lygodactylus</i>	<i>capensis</i>	Common Dwarf Gecko	Least Concern (SARCA 2014)	
<i>Pachydactylus</i>	<i>capensis</i>	Cape Gecko	Least Concern (SARCA 2014)	
<i>Gerrhosaurus</i>	<i>flavigularis</i>	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)	
<i>Nucras</i>	<i>holubi</i>	Holub's Sandveld Lizard	Least Concern (SARCA 2014)	
<i>Pedioplanis</i>	<i>lineoocellata</i>	Spotted Sand Lizard	Least Concern (SARCA 2014)	
<i>Leptotyphlops</i>	<i>scutifrons</i>	Eastern Thread Snake	Not listed	
<i>Leptotyphlops</i>	<i>scutifrons</i>	Peters' Thread Snake	Not listed	
<i>Pelomedusa</i>	<i>subrufa</i>	Central Marsh Terrapin	Least Concern (SARCA 2014)	
<i>Acontias</i>	<i>gracilicauda</i>	Thin-tailed Legless Skink	Least Concern (SARCA 2014)	Yes
<i>Afroablepharus</i>	<i>wahlbergii</i>	Wahlberg's Snake-eyed	Least Concern	

Genus	Species	Common name	Red list category	Atlas region endemic
		Skink	(SARCA 2014)	
<i>Trachylepis</i>	<i>capensis</i>	Cape Skink	Least Concern (SARCA 2014)	
<i>Trachylepis</i>	<i>punctatissima</i>	Speckled Rock Skink	Least Concern (SARCA 2014)	
<i>Trachylepis</i>	<i>punctulata</i>	Speckled Sand Skink	Least Concern (SARCA 2014)	
<i>Trachylepis</i>	<i>varia</i>	Variable Skink	Least Concern (SARCA 2014)	
<i>Homopus</i>	<i>femorialis</i>	Greater Padloper	Least Concern (SARCA 2014)	Yes
<i>Psammobates</i>	<i>oculifer</i>	Serrated Tent Tortoise	Least Concern (SARCA 2014)	
<i>Stigmochelys</i>	<i>pardalis</i>	Leopard Tortoise	Least Concern (SARCA 2014)	
<i>Rhinotyphlops</i>	<i>lalandei</i>	Delalande's Beaked Blind Snake	Least Concern (SARCA 2014)	
<i>Varanus</i>	<i>albigularis</i>	Rock Monitor	Least Concern (SARCA 2014)	
<i>Bitis</i>	<i>arietans</i>	Puff Adder	Least Concern (SARCA 2014)	

12.6.3 Amphibians

Table 11 below provides a list of frogs found in the QDS around the site according to Frog Atlas of Southern African. Only one species of conservation importance has been recorded in grid cell 2926AA, namely the Giant Bull Frog (*Pyxicephalus adspersus*) (ADU, 2015).

Table 11: Amphibian species recorded in the grid cell 2926AA (ADU, 2015), which could potentially occur on the proposed mixed-use development

Genus	Species	Common name	Red list category	Atlas region endemic
<i>Amietophrynus</i>	<i>poweri</i>	Power's Toad	Least Concern	
<i>Amietophrynus</i>	<i>rangeri</i>	Raucous Toad	Least Concern	
<i>Poyntonophrynus</i>	<i>vertebralis</i>	Southern Pygmy Toad	Least Concern	
<i>Vandijkophrynus</i>	<i>gariensis</i>	Karoo Toad	Least Concern	
<i>Kassina</i>	<i>senegalensis</i>	Bubbling Kassina	Least Concern	
<i>Xenopus</i>	<i>laevis</i>	Common Platanna	Least Concern	
<i>Amietia</i>	<i>fuscigula</i>	Cape River Frog	Least Concern	
<i>Amietia</i>	<i>quecketti</i>	Drakensberg River Frog	Least Concern	Yes
<i>Cacosternum</i>	<i>boettgeri</i>	Common Caco	Least Concern	
<i>Pyxicephalus</i>	<i>adspersus</i>	Giant Bull Frog	Near Threatened	
<i>Tomopterna</i>	<i>cryptotis</i>	Tremelo Sand Frog	Least Concern	

12.6.4 Avifauna

Several conservation and planning tools were reviewed for relevancy in terms of the project area, and it was found that the study area did not contain or form part of any Important Bird

and Biodiversity Area (IBA). IBAs are areas that are considered to be of critical importance for the conservation of avifauna. IBAs are identified based on one or more of the following criteria 1) holding significant numbers of one or more globally threatened species 2) are one of a set of sites that together hold a suite of restricted-range species or biome-restricted species, 3) have exceptionally large numbers of migratory or congregatory species (Fishpool & Evans 2001, Birdlife International 2014).

No IBA was recorded near the proposed project area, as indicated in **Figure 25** below. The closest one is situated approximately 42Km away, namely Soetdoring Nature Reserve- IBA.

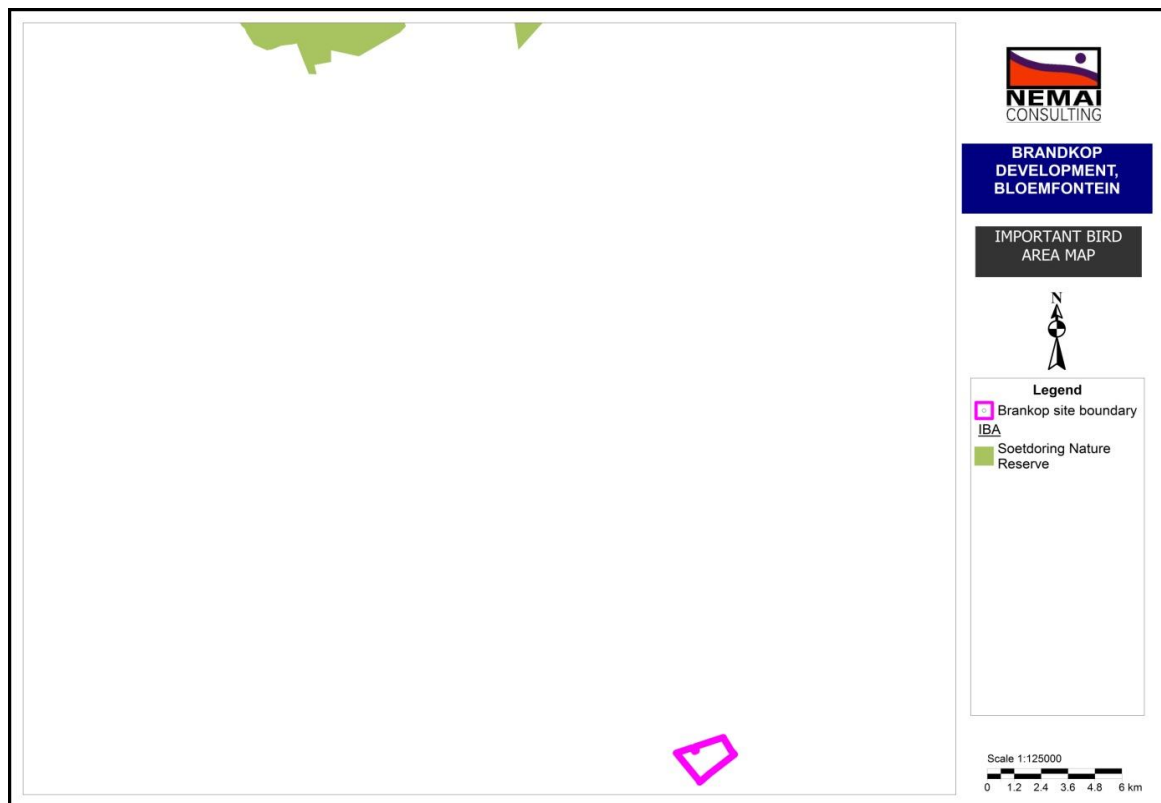


Figure 25: Nearest IBA is the KwaZulu-Natal Mistbelt Grassland IBA

According to the Southern African Bird Atlas Project (SABAP) 2, a large number of bird species have been noted in grid cell 2926AA (**Table 12**).

Table 12: Bird Species Noted in the Area (SABAP2)

Species Name	Afrikaans Name	Taxonomic Name
Avocet, Pied	Bontelsie	Recurvirostra avosetta
Barbet, Acacia Pied	Bonthoutkapper	Tricholaema leucomelas
Barbet, Black-collared	Rooikophoutkapper	Lybius torquatus

Species Name	Afrikaans Name	Taxonomic Name
Barbet, Crested	Kuifkophoutkapper	Trachyphonus vaillantii
Batis, Pririt	Piritbosbontrokkie	Batis pririt
Bee-eater, European	Europese Byvreter	Merops apiaster
Bee-eater, White-fronted	Rooikeelbyvreter	Merops bullockoides
Bishop, Southern Red	Rooivink	Euplectes orix
Bishop, Yellow-crowned	Goudgeelvink	Euplectes afer
Bokmakierie, Bokmakierie	Bokmakierie	Telophorus zeylonus
Bulbul, African Red-eyed	Rooioogtiptol	Pycnonotus nigricans
Bunting, Cape	Rooivlerkstreepkoppie	Emberiza capensis
Bunting, Cinnamon-breasted	Klipstreepkoppie	Emberiza tahapisi
Bunting, Golden-breasted	Rooirugstreepkoppie	Emberiza flaviventris
Bunting, Lark-like	Vaalstreepkoppie	Emberiza impetuani
Buttonquail, Kurrichane	Bosveldkwarteltjie	Turnix sylvaticus
Buzzard, Jackal	Rooiborsjakkalsvoel	Buteo rufofuscus
Buzzard, Steppe	Bruinjakkalsvoel	Buteo vulpinus
Canary, Black-headed	Swartkopkanarie	Serinus alario
Canary, Black-throated	Bergkanarie	Crithagra atrogularis
Canary, Cape	Kaapse Kanarie	Serinus canicollis
Canary, White-throated	Witkeelkanarie	Crithagra albogularis
Canary, Yellow	Geelkanarie	Crithagra flaviventris
Chat, Anteating	Swartpiek	Myrmecocichla formicivora
Chat, Familiar	Gewone Spekvreter	Cercomela familiaris
Chat, Sickle-winged	Vlaktespekvreter	Cercomela sinuata
Cisticola, Cloud	Gevlekte Klopkloppie	Cisticola textrix
Cisticola, Desert	Woestynklopkloppie	Cisticola aridulus
Cisticola, Grey-backed	Gysrugtinkinkie	Cisticola subruficapilla
Cisticola, Levillant's	Vleitinkinkie	Cisticola tinniens
Cisticola, Zitting	Landeryklopkloppie	Cisticola juncidis
Cliff-Swallow, South African	Familieswael	Hirundo spilodera
Coot, Red-knobbed	Bleshoender	Fulica cristata
Cormorant, Reed	Rietduiker	Phalacrocorax africanus
Cormorant, White-breasted	Witborsduiker	Phalacrocorax carbo
Coucal, Burchell's	Gewone Vleiloerie	Centropus burchellii
Coucal, White-browed	Gestreepte Vleiloerie	Centropus superciliosus
Courser, Double-banded	Dubbelbanddrawwertjie	Rhinoptilus africanus
Crane, Blue	Bloukraanvoel	Anthropoides paradiseus
Crombec, Long-billed	Bosveldstompstert	Sylvietta rufescens
Crow, Pied	Witborskraai	Corvus albus
Cuckoo, Diderick	Diederikkie	Chrysococcyx caprius
Cuckoo, Jacobin	Bontnuwejaarsvoel	Clamator jacobinus
Cuckoo, Klaas's	Meitjie	Chrysococcyx klaas

Species Name	Afrikaans Name	Taxonomic Name
Cuckoo, Red-chested	Piet-my-vrou	Cuculus solitarius
Darter, African	Slanghalsvoel	Anhinga rufa
Dove, Laughing	Rooiborsduifie	Streptopelia senegalensis
Dove, Namaqua	Namakwaduifie	Oena capensis
Dove, Red-eyed	Grootringduif	Streptopelia semitorquata
Dove, Rock	Tuinduif	Columba livia
Drongo, Fork-tailed	Mikstertbyvanger	Dicrurus adsimilis
Duck, African Black	Swarteend	Anas sparsa
Duck, Maccoa	Bloubekeend	Oxyura maccoa
Duck, White-backed	Witrugeend	Thalassornis leuconotus
Duck, White-faced	Nonnetjie-eend	Dendrocygna viduata
Duck, Yellow-billed	Geelbekeend	Anas undulata
Eagle, Booted	Dwergarend	Aquila pennatus
Eagle, Tawny	Roofarend	Aquila rapax
Eagle-Owl, Spotted	Gevlekte Ooruil	Bubo africanus
Egret, Cattle	Veereier	Bubulcus ibis
Egret, Great	Grootwitreier	Egretta alba
Egret, Little	Kleinwitreier	Egretta garzetta
Egret, Yellow-billed	Geelbekwitreier	Egretta intermedia
Eremomela, Yellow-bellied	Geelpensbossanger	Eremomela icteropygialis
Falcon, Amur	Oostelike Rooipootvalk	Falco amurensis
Falcon, Lanner	Edelvalk	Falco biarmicus
Falcon, Peregrine	Swervalk	Falco peregrinus
Finch, Red-headed	Rooikopvink	Amadina erythrocephala
Finch, Scaly-feathered	Baardmanneljie	Sporopipes squamifrons
Firefinch, Red-billed	Rooibekvuurvinkie	Lagonosticta senegala
Fiscal, Common	Fiskaallaksman	Lanius collaris
Flamingo, Greater	Grootflamink	Phoenicopterus ruber
Flycatcher, Fairy	Feevlieievanger	Stenostira scita
Flycatcher, Fiscal	Fiskaalvlieievanger	Sigelus silens
Flycatcher, Spotted	Europese Vlieievanger	Muscicapa striata
Fringin, Grey-winged	Bergpatrys	Scleroptila africanus
Fringin, Orange River	Kalaharipatrys	Scleroptila levaillantoides
Goose, Egyptian	Kolgans	Alopochen aegyptiacus
Goose, Spur-winged	Wildemakou	Plectropterus gambensis
Goshawk, Gabar	Kleinsingvalk	Melierax gabar
Goshawk, Southern Pale Chanting	Bleeksingvalk	Melierax canorus
Grass-Owl, African	Grasuil	Tyto capensis
Grebe, Black-necked	Swartnekdoobertjie	Podiceps nigricollis
Grebe, Little	Kleindobbertjie	Tachybaptus ruficollis
Greenshank, Common	Groenpootruiter	Tringa nebularia

Species Name	Afrikaans Name	Taxonomic Name
Guineafowl, Helmeted	Gewone Tarentaal	Numida meleagris
Gull, Grey-headed	Gryskopmeeu	Larus cirrocephalus
Gull, Heuglin's	Heuglinse meeu	Larus heuglini
Gull, Lesser Black-backed	Kleinswartrugmeeu	Larus fuscus
Hamerkop, Hamerkop	Hamerkop	Scopus umbretta
Harrier, Black	Witkruisvleivalk	Circus maurus
Heron, Black-headed	Swartkopreier	Ardea melanocephala
Heron, Goliath	Reusereier	Ardea goliath
Heron, Green-backed	Groenrugreier	Butorides striata
Heron, Grey	Bloureier	Ardea cinerea
Heron, Purple	Rooiereier	Ardea purpurea
Heron, Squacco	Ralreier	Ardeola ralloides
Honeyguide, Lesser	Kleinheuningwyser	Indicator minor
Hoopoe, African	Hoephoep	Upupa africana
House-Martin, Common	Huisswael	Delichon urbicum
Ibis, African Sacred	Skoorsteenveer	Threskiornis aethiopicus
Ibis, Glossy	Glansibis	Plegadis falcinellus
Ibis, Hadedada	Hadedada	Bostrychia hagedash
Jacana, African	Grootlangtoon	Actophilornis africanus
Kestrel, Greater	Grootrooivalk	Falco rupicoloides
Kestrel, Lesser	Kleinrooivalk	Falco naumanni
Kestrel, Rock	Kransvalk	Falco rupicolus
Kingfisher, Brown-hooded	Bruinkopvisvanger	Halcyon albiventris
Kingfisher, Giant	Reusevisvanger	Megaceryle maximus
Kingfisher, Malachite	Kuifkopvisvanger	Alcedo cristata
Kingfisher, Pied	Bontvisvanger	Ceryle rudis
Kite, Black-shouldered	Blouvalk	Elanus caeruleus
Korhaan, Blue	Bloukorhaan	Eupodotis caerulescens
Korhaan, Northern Black	Witvlerkkorhaan	Afrotis afraoides
Lapwing, Blacksmith	Bontkiewiet	Vanellus armatus
Lapwing, Crowned	Kroonkiewiet	Vanellus coronatus
Lark, Agulhas Clapper	Overbergklappertjie	Mirafrja marjoriae
Lark, Agulhas Long-billed	Overberglangbeklewerik	Certhilauda brevirostris
Lark, Benguela Long-billed	Kaokolangbeklewerik	Certhilauda benguelensis
Lark, Cape Clapper	Kaapse Klappertjie	Mirafrja apiata
Lark, Cape Long-billed	Weskuslangbeklewerik	Certhilauda curvirostris
Lark, Eastern Clapper	Hoefeldklappertjie	Mirafrja fasciolata
Lark, Eastern Long-billed	Grasveldlangbeklewerik	Certhilauda semitorquata
Lark, Karoo Long-billed	Karoolangbeklewerik	Certhilauda subcoronata
Lark, Melodious	Spotlewerik	Mirafrja cheniana
Lark, Pink-billed	Pienkbeklewerik	Spizocorys conirostris

Species Name	Afrikaans Name	Taxonomic Name
Lark, Red-capped	Rooikoplewerik	<i>Calandrella cinerea</i>
Lark, Rufous-naped	Rooineklewerik	<i>Mirafraga africana</i>
Lark, Spike-heeled	Vlaktelewerik	<i>Chersomanes albofasciata</i>
Longclaw, Cape	Oranjekeelkalkoentjie	<i>Macronyx capensis</i>
Martin, Brown-throated	Afrikaanse Oewerswael	<i>Riparia paludicola</i>
Martin, Rock	Kransswael	<i>Hirundo fuligula</i>
Masked-Weaver, Southern	Swartkeelgeelvink	<i>Ploceus velatus</i>
Moorhen, Common	Grootwaterhoender	<i>Gallinula chloropus</i>
Mousebird, Red-faced	Rooiwangmuisvoel	<i>Urocolius indicus</i>
Mousebird, Speckled	Gevlekte Muisvoel	<i>Colius striatus</i>
Mousebird, White-backed	Witkruismuisvoel	<i>Colius colius</i>
Myna, Common	Indiese Spreeu	<i>Acridotheres tristis</i>
Neddicky, Neddicky	Neddikkie	<i>Cisticola fulvicapilla</i>
Night-Heron, Black-crowned	Gewone Nagreier	<i>Nycticorax nycticorax</i>
Nightjar, European	Europese Naguil	<i>Caprimulgus europaeus</i>
Nightjar, Fiery-necked	Afrikaanse Naguil	<i>Caprimulgus pectoralis</i>
Nightjar, Rufous-cheeked	Rooiwangnaguil	<i>Caprimulgus rufigena</i>
Ostrich, Common	Volstruis	<i>Struthio camelus</i>
Owl, Barn	Nonnetjie-uil	<i>Tyto alba</i>
Owl, Marsh	Vlei-uil	<i>Asio capensis</i>
Palm-Swift, African	Palmwindswael	<i>Cypsiurus parvus</i>
Paradise-Flycatcher, African	Paradysvlievanger	<i>Terpsiphone viridis</i>
Penduline-Tit, Cape	Kaapse Kapokvoel	<i>Anthoscopus minutus</i>
Pigeon, Speckled	Kransduif	<i>Columba guinea</i>
Pipit, African	Gewone Koester	<i>Anthus cinnamomeus</i>
Pipit, African Rock	Klipkoester	<i>Anthus crenatus</i>
Pipit, Long-billed	Nicholsonse Koester	<i>Anthus similis</i>
Pipit, Plain-backed	Donkerkoester	<i>Anthus leucophrys</i>
Plover, Common Ringed	Ringnekstrandkiewiet	<i>Charadrius hiaticula</i>
Plover, Three-banded	Driebandstrandkiewiet	<i>Charadrius tricollaris</i>
Pochard, Southern	Bruineend	<i>Netta erythrophthalma</i>
Prinia, Black-chested	Swartbandlangstertjie	<i>Prinia flavicans</i>
Prinia, Drakensberg	Drakensberglangstertjie	<i>Prinia hypoxantha</i>
Prinia, Karoo	Karoolangstertjie	<i>Prinia maculosa</i>
Quail, Common	Afrikaanse Kwartel	<i>Coturnix coturnix</i>
Quailfinch, African	Gewone Kwartelvinkie	<i>Ortygospiza atricollis</i>
Quelea, Red-billed	Rooibekkwelea	<i>Quelea quelea</i>
Reed-Warbler, African	Kleinrietsanger	<i>Acrocephalus baeticatus</i>
Reed-Warbler, Great	Grootrietsanger	<i>Acrocephalus arundinaceus</i>
Robin-Chat, Cape	Gewone Janfrederik	<i>Cossypha caffra</i>
Rock-Thrush, Short-toed	Korttoonkliplyster	<i>Monticola brevipes</i>

Species Name	Afrikaans Name	Taxonomic Name
Roller, European	Europese Troupant	Coracias garrulus
Roller, Lilac-breasted	Gewone Troupant	Coracias caudatus
Ruff, Ruff	Kemphaan	Philomachus pugnax
Sandpiper, Common	Gewone Ruiter	Actitis hypoleucos
Sandpiper, Curlew	Krombekstrandloper	Calidris ferruginea
Sandpiper, Marsh	Moerasruiter	Tringa stagnatilis
Sandpiper, Wood	Bosruiter	Tringa glareola
Scimitarbill, Common	Swartbekkakelaar	Rhinopomastus cyanomelas
Scrub-Robin, Kalahari	Kalahariwipstert	Cercotrichas paena
Scrub-Robin, Karoo	Slangverklikker	Cercotrichas coryphoeus
Secretarybird, Secretarybird	Sekretarisvoel	Sagittarius serpentarius
Shelduck, South African	Kopereend	Tadorna cana
Shoveler, Cape	Kaapse Slopeend	Anas smithii
Shrike, Lesser Grey	Gryslaksman	Lanius minor
Shrike, Red-backed	Rooiruglaksman	Lanius collurio
Snipe, African	Afrikaanse Snip	Gallinago nigripennis
Sparrow, Cape	Gewone Mossie	Passer melanurus
Sparrow, Great	Grootmossie	Passer motitensis
Sparrow, House	Huis mossie	Passer domesticus
Sparrow, Northern Grey-headed	Witkeelmossie	Passer griseus
Sparrow, Southern Grey-headed	Gryskopmossie	Passer diffusus
Sparrow-Weaver, White-browed	Koringvoel	Plocepasser mahali
Sparrowhawk, Black	Swartsperwer	Accipiter melanoleucus
Sparrowlark, Grey-backed	Gryruglewierik	Eremopterix verticalis
Spoonbill, African	Lepelaar	Platalea alba
Spurfowl, Swainson's	Bosveldfisant	Pternistis swainsonii
Starling, Cape Glossy	Kleinglansspreeu	Lamprotornis nitens
Starling, Common	Europese Spreeu	Sturnus vulgaris
Starling, Pied	Witgatspreeu	Spreo bicolor
Starling, Red-winged	Rooivlerkspreeu	Onychognathus morio
Starling, Wattled	Lelspreeu	Creatophora cinerea
Stilt, Black-winged	Rooipootelsie	Himantopus himantopus
Stint, Little	Kleinstrandloper	Calidris minuta
Stonechat, African	Gewone Bontrokkie	Saxicola torquatus
Stork, Abdim's	Kleinswartooievaar	Ciconia abdimii
Stork, Black	Grootswartooievaar	Ciconia nigra
Stork, White	Witooievaar	Ciconia ciconia
Stork, Yellow-billed	Nimmersat	Mycteria ibis
Sunbird, Dusky	Namakwasuikerbekkie	Cinnyris fuscus
Sunbird, Malachite	Jangroentjie	Nectarinia famosa
Sunbird, White-bellied	Witpenssuikerbekkie	Cinnyris talatala

Species Name	Afrikaans Name	Taxonomic Name
Swallow, Barn	Europese Swael	<i>Hirundo rustica</i>
Swallow, Greater Striped	Grootstreepswael	<i>Hirundo cucullata</i>
Swallow, Pearl-breasted	PiÅ½relborsswael	<i>Hirundo dimidiata</i>
Swallow, Red-breasted	Rooiborsswael	<i>Hirundo semirufa</i>
Swallow, White-throated	Witkeelwael	<i>Hirundo albigularis</i>
Swamp-Warbler, Lesser	Kaapse Rietsanger	<i>Acrocephalus gracilirostris</i>
Swamphen, African Purple	Grootkoningriethaan	<i>Porphyrio madagascariensis</i>
Swift, African Black	Swartwindswael	<i>Apus barbatus</i>
Swift, Alpine	Witpenswindswael	<i>Tachymarptis melba</i>
Swift, Common	Europese Windswael	<i>Apus apus</i>
Swift, Horus	Horuswindswael	<i>Apus horus</i>
Swift, Little	Kleinwindswael	<i>Apus affinis</i>
Swift, White-rumped	Witkruiswindswael	<i>Apus caffer</i>
Tchagra, Brown-crowned	Rooivlerktjagra	<i>Tchagra australis</i>
Teal, Cape	Teeleend	<i>Anas capensis</i>
Teal, Red-billed	Rooibekeend	<i>Anas erythrorhyncha</i>
Tern, Whiskered	Witbaardsterretjie	<i>Chlidonias hybrida</i>
Tern, White-winged	Witvlerksterretjie	<i>Chlidonias leucopterus</i>
Thick-knee, Spotted	Gewone Dikkop	<i>Burhinus capensis</i>
Thrush, Karoo	Geelbeklyster	<i>Turdus smithi</i>
Thrush, Olive	Olyflyster	<i>Turdus olivaceus</i>
Tit, Ashy	Akasiagrysmees	<i>Parus cinerascens</i>
Tit-Babbler, Chestnut-vented	Bosveldtjeriktik	<i>Parisoma subcaeruleum</i>
Tit-Babbler, Layard's	Grystjeriktik	<i>Parisoma layardi</i>
Turtle-Dove, Cape	Gewone Tortelduif	<i>Streptopelia capicola</i>
Wagtail, Cape	Gewone Kwikkie	<i>Motacilla capensis</i>
Warbler, Garden	Tuinsanger	<i>Sylvia borin</i>
Warbler, Rufous-eared	Rooioorlangstertjie	<i>Malcorus pectoralis</i>
Warbler, Willow	Hofsanger	<i>Phylloscopus trochilus</i>
Waxbill, Blue	Gewone Blousysie	<i>Uraeginthus angolensis</i>
Waxbill, Common	Rooibeksysie	<i>Estrilda astrild</i>
Waxbill, Orange-breasted	Rooiassie	<i>Amandava subflava</i>
Weaver, Cape	Kaapse Wewer	<i>Ploceus capensis</i>
Wheatear, Mountain	Bergwagter	<i>Oenanthe monticola</i>
White-eye, Cape	Kaapse Glasogie	<i>Zosterops virens</i>
White-eye, Orange River	Gariepglasogie	<i>Zosterops pallidus</i>
Whydah, Pin-tailed	Koningrooibekkie	<i>Vidua macroura</i>
Whydah, Shaft-tailed	Pylstertrooibekkie	<i>Vidua regia</i>
Widowbird, Long-tailed	Langstertflap	<i>Euplectes progne</i>
Woodpecker, Cardinal	Kardinaalspeg	<i>Dendropicos fuscescens</i>
Wryneck, Red-throated	Draihals	<i>Jynx ruficollis</i>

12.7 Land Capability

Figure 26 shows that the area of the site is mostly used for cattle farming. **Figure 27** shows that the site has a marginal potential for agricultural land. In addition, part of the proposed site is used as agricultural land for cultivation and subsistence farming (comprising mostly of livestock) (**Figures 28, 29 and 30**).

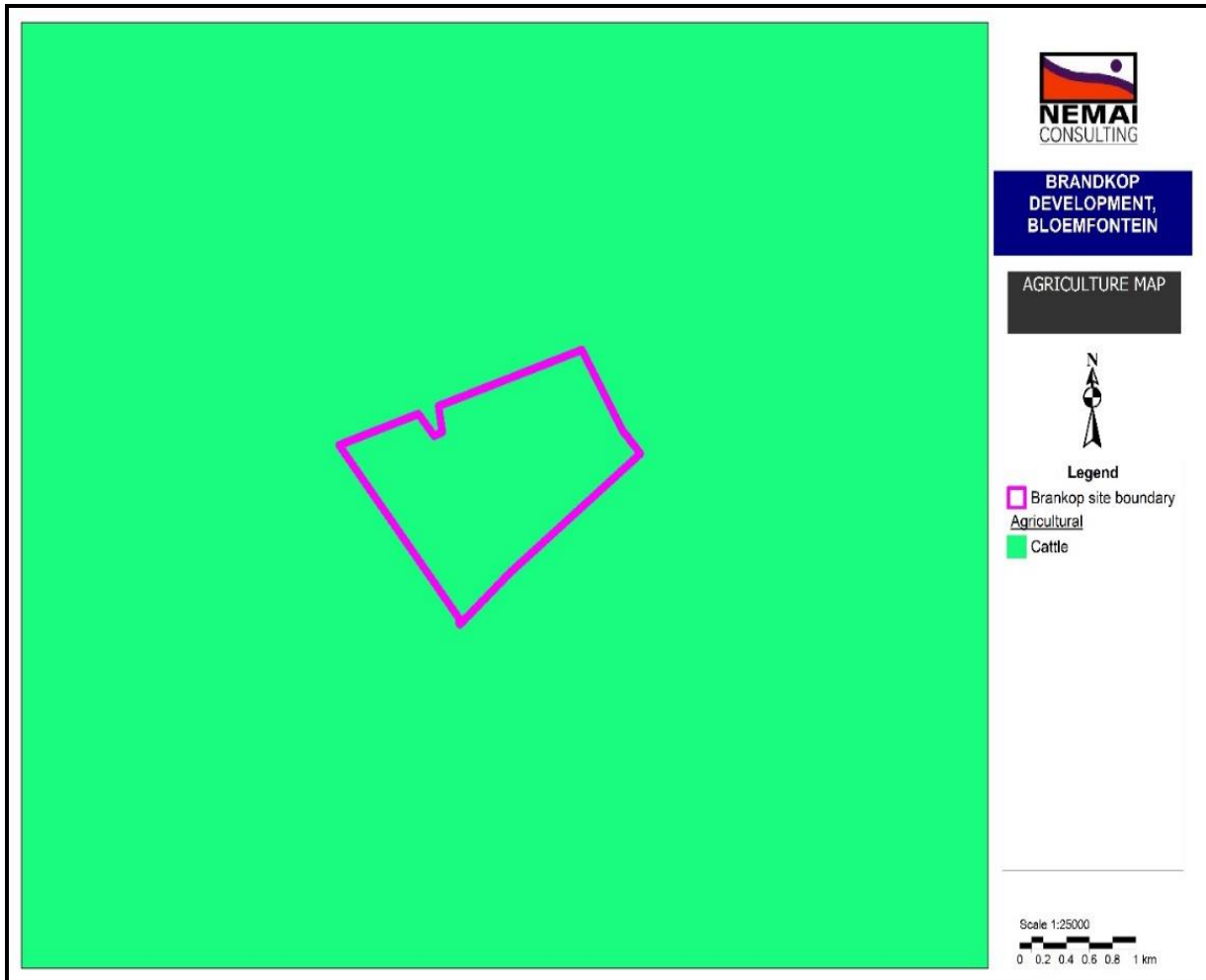


Figure 26: Agricultural Use

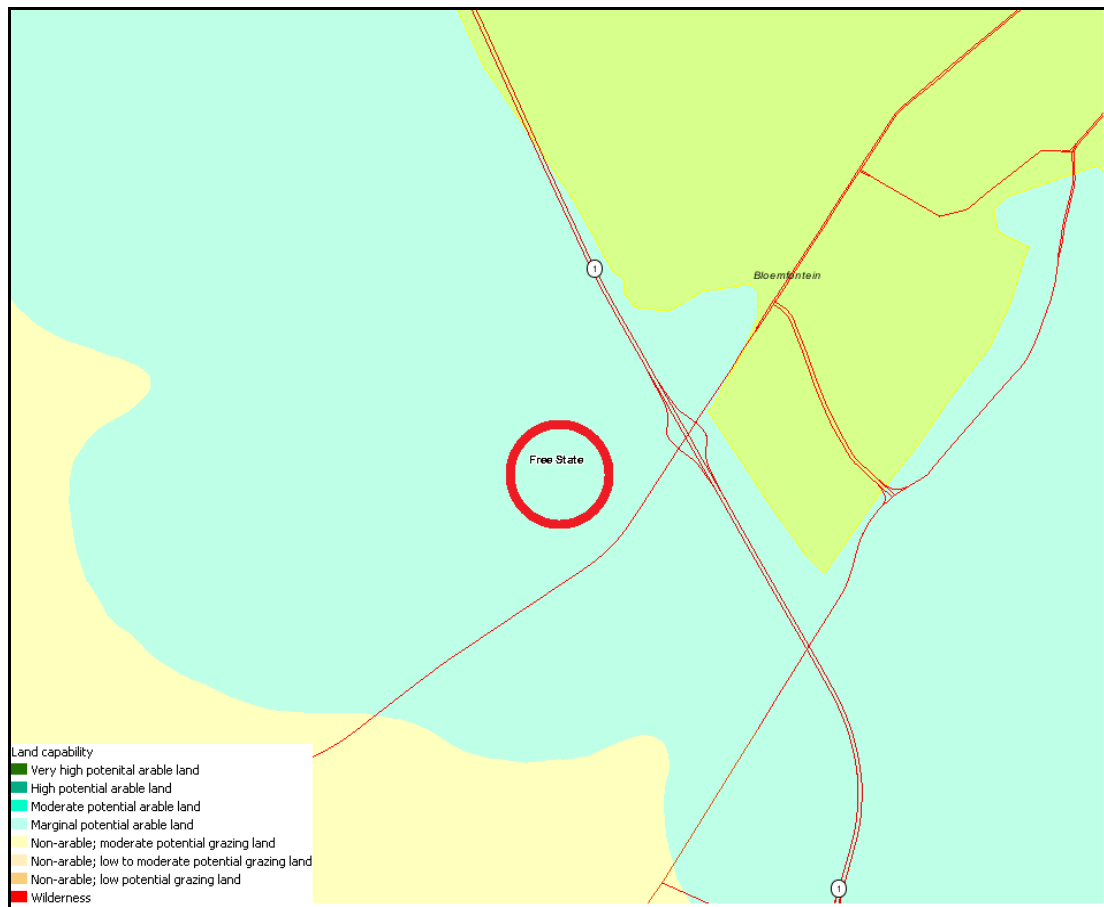


Figure 27: Agricultural Potential

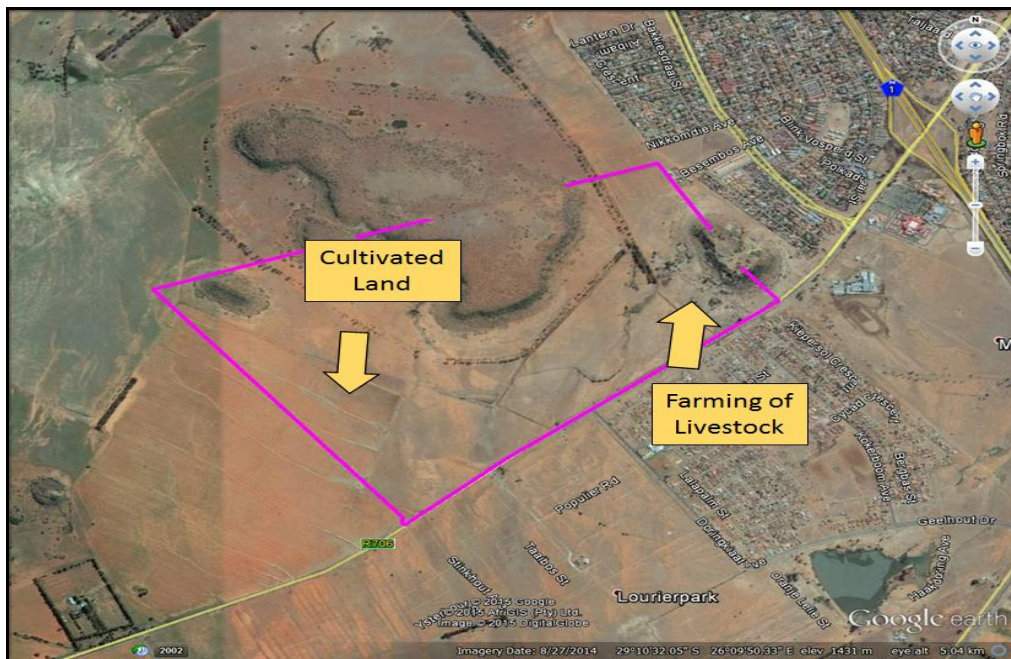


Figure 28: Agricultural Use on the Site



Figure 29: Photographs of the livestock farming on site



Figure 30: Photographs of the cultivated land on site

12.8 Heritage

The regional area around the site does not seem to show evidence of having any important heritages sites.

The South African Heritage Resources Information System (SAHRIS) has compiled a paleontological sensitivity map. This map shows that the sensitivity of part of the site is very high (in red) while some parts are insignificant (in grey) (**Figure 31**).

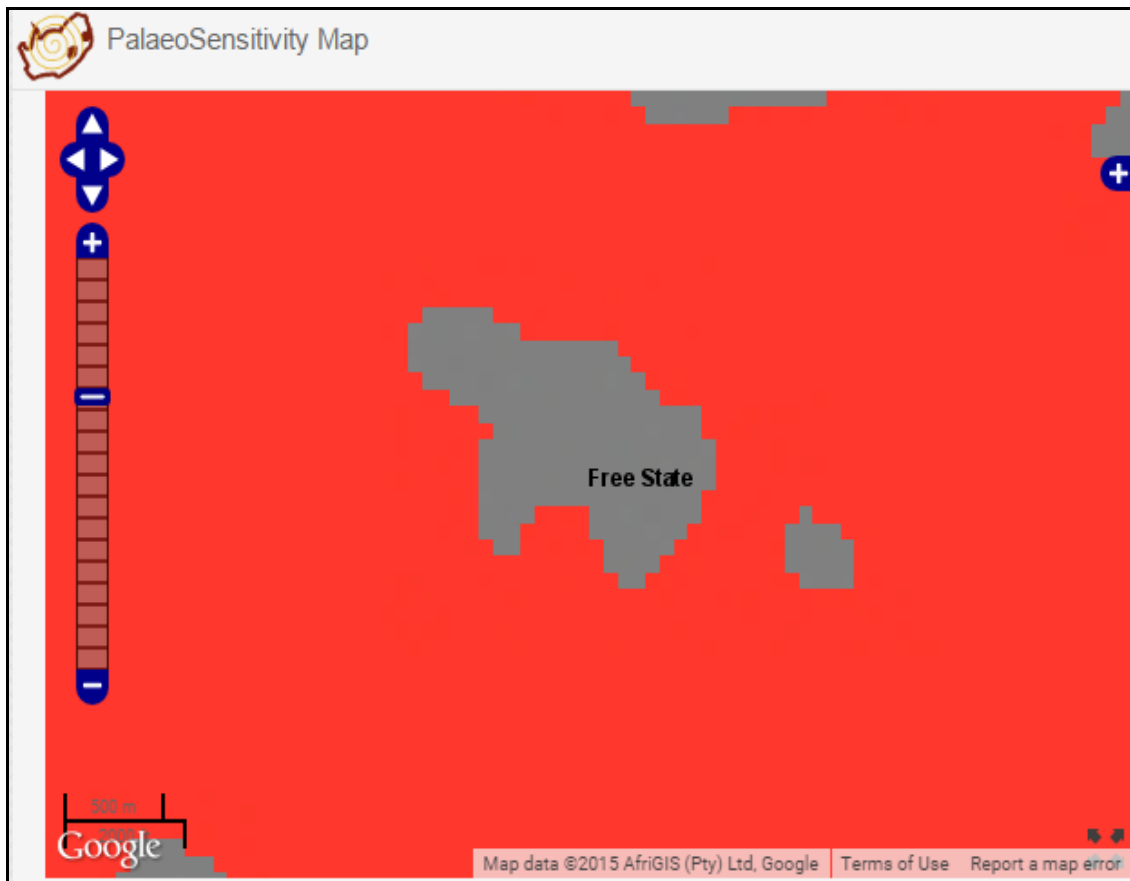


Figure 31: Palaeomap of the site (SAHRIS, 2013)

12.9 Air Quality

Due to the nature of the study area (natural vacant open space), the air quality is regarded to be good. Localised impacts to air quality include burning of emissions from vehicles travelling on the surrounding road network, dust from un-vegetated areas and dirt roads, smoke (veld fires), agricultural activities, and methane release from cattle.

In the greater area, air quality is influenced by anthropogenic activities in urbanised areas such as Bloemfontein.

Sensitive receptors to dust and other air quality impacts in the study area include human settlements.

12.10 Noise

The natural state of the study area affords it tranquillity. The dwellings of the subsistence farmers on the site are the only structures on the site.

Noise in the region emanates primarily from households, farming operations (e.g. use of farming equipment), and vehicles on the road network. The undulating hills and ridges/"koppies" serve as noise attenuation features, although the ambient noise levels are regarded as insignificant.

12.11 Planning

According to the MMM IDP and SDF (**Figure 32**), there is a strategic need for the Brandkop Mixed-Use Development. The MMM IDP strives to ensure the development of suitably located housing, with the Brandkop Farm No. 702 being one the proposed land parcels. The strategic need for this development is to improve urban integration to redress spatial imbalances of the past.

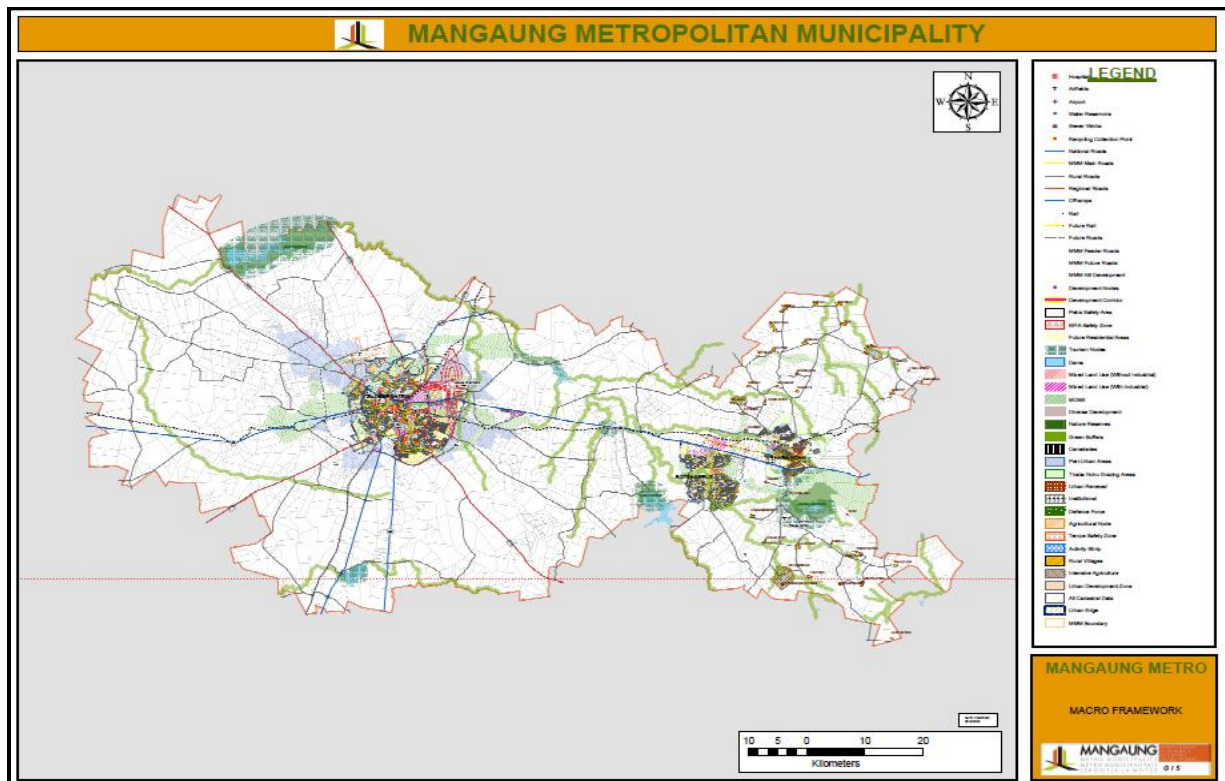


Figure 32: MMM SDF (2010-2011)

12.12 Infrastructure

The only existing structures that occur on the study site are the dwellings of the subsistence farmers/settlers (**Figure 33**). These settlers have an agreement with MMM to currently settle on the land. There are no other existing servitudes on the site.



Figure 33: Photographs of the dwellings on site

12.13 Availability of Services

The proposed development will require bulk water, sewer and electrical services. More detail on the service requirements included in the scope of the development is provided in Section 6.1.

12.14 Access Roads

The R706 (Jagersfontein Road) forms the south eastern boundary of the proposed site. Access to site can be obtained from the N1 Bloemfontein through the R706 road. The proposed development has four proposed access points (Refer to previous **Figure 2**):

- Access 1 – Besembos Avenue
- Access 2 – Kokerboom Avenue
- Access 3 – Near Doringklaat Avenue
- Access 4 – Off R706 Road

12.15 Waste Management

The following should be noted with regards to waste management during the construction Phase:

- Temporary waste storage facilities will remain below the thresholds contained in the listed activities of NEM:WA; and
- The EMPr will make suitable provisions for waste management, including the storage, handling and disposal of waste.

12.16 Visual Aesthetics

The project area is afforded high aesthetic appeal through topographical features such as the “koppies” / ridges on the vacant site (**Figure 34**). The area’s natural state further contributes to the visual quality encountered in the area. The site borders the town nearby (Pellissier) as well as the Brandkop Conservancy therefore these areas have a view of the mountains regional area around them.



Figure 34: View from the top of one of the “koppies”

12.17 Socio-Economic Environment

The proposed location of the development falls within the Mangaung Metropolitan Municipality (MMM). According to the MMM Integrated Development Plan (IDP), Mangaung covers 6 863 km² and comprises three prominent urban centres (Bloemfontein, Botshabelo and Thaba Nchu), which are surrounded by an extensive rural area. It is centrally located within the Free State Province and is accessible via national infrastructure including the N1 (which links Gauteng with the Southern and Western Cape), the N6 (which links Bloemfontein to the Eastern Cape), and the N8 (which links Lesotho in the east with the Northern Cape in the west via Bloemfontein).

Bloemfontein is the sixth largest city in South Africa and the capital of the Free State Province. The City is the Judicial Capital of South Africa and serves as the administrative headquarters of the province. It also represents the economic hub of the local economy. The area is serviced by an east/west and north/south railway line and a national airport. The Mangaung Local Municipality (MLM) was established in 2000 with the amalgamation of four former transitional councils, but was recently (April 2011) elevated from category “B” municipality to a category “A” metropolitan municipality.

More than half of the population is concentrated in the Bloemfontein area (52%), followed Botshabelo (28%). According to Census 2011 Municipal Factsheet, the population of the MMM was 747 431 in 2011. This figure increased from 645, 438 in 2001. Mangaung is the largest contributor to the Gross Domestic Product (GDP) of the province with diverse economies as can be seen by the table below (IDP, 2013). The following trends were highlighted in the growth patterns of economic sectors in Mangaung Agriculture has dropped from 1.5% to 1.2 % and indications are that it will stagnate at this percent until 2016 (global insight 2013). Mining has grown from 0.0% to 01% but also indications shows that it will remain so until at least 2016. Whereas most of the sectors above have been showing a decline not only in the municipality but generally in the province general government services have increased from 2.7% to 2.8% between 1996 and 2011. Despite the decline in some sectors, the economy of Mangaung continues to grow, albeit at a low rate of 3% per annum.

Income levels are a determining factor indicating the socio-economic health of an area. Gross Value Added (GVA) is defined as the total value of all the goods produced in a specific area during a specific period. GVA allows for the determining the overall welfare of the population. While it is not a comprehensive measure and provides no indication of the distribution of welfare, it is still important an important indicator. The GVA was taken from Quantec Research Easy Data. Quantec Research defines the major sectors into Primary Sector, which is Extractive, Secondary Sector, made up of manufacturing and the Tertiary Sector, which comprises of services.

Business service and finance is the largest sector in MMM contributing 23 percent to GVA with general government the second largest sector accounting for 20 percent. General government is followed by community services which signifies a high dependency on the local government for employment, growth and investment in the economy (**Table 13**).

Table 13: 2013 GVA for Mangaung Metropolitan Municipality

Industry	Rands	Percentage
Mining and quarrying	R 185.00	1%
Agriculture, forestry and fishing	R 590.00	2%
Construction	R 696.00	2%
Electricity, gas and water	R 1 059.00	3%
Manufacturing	R 3 408.00	11%
Wholesale and retail trade, catering and accommodation	R 3 454.00	11%
Transport, storage and communication	R 3 941.00	12%
Community, social and personal services	R 4 505.00	14%
General government	R 6 475.00	20%
Finance, insurance, real estate and business services (FIRE)	R 7 365.00	23%

Industry	Rands	Percentage
Total	R 31 678.00	100%

According to Census 2011 Municipal Factsheet, the unemployment rate for the MMM was 27.7% having dropped quite substantially from an unemployment rate of 40.1% in 2001. It is unclear what caused the drop in unemployment, however, the youth unemployment rate remains high at 37.2% which is lower than in 2001 when it was 49,1%. According to Census 2011 Municipal Factsheet, the amount of children without schooling had decreased from 10.9% in 2001 to 4.3% in 2011 and people with higher education (beyond matric) had increased to close to 14% from just above 9% in 2001.

13 SUMMARY OF SPECIALIST STUDIES

13.1 Specialist Studies undertaken as part of the EIA

A crucial element of the Plan of Study for the EIA prepared during the Scoping phase was to provide the Terms of Reference for the requisite Specialist Studies triggered during Scoping. According to Münster (2005), a 'trigger' is "a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input". The requisite Specialist Studies 'triggered' by the findings of the Scoping process, aimed at addressing the key issues and compliance with legal obligations, include:

7. Terrestrial Ecological Assessment;
8. Wetland Delineation and Aquatic Health Assessment;
9. Visual Impact Assessment.
10. Agricultural Potential Study;
11. Phase 1 Heritage Impact Assessment; and
12. Paleontological Impact Assessment.

For the inclusion of the findings of the Specialist Studies into the EIA report, the following guideline was used: *Guideline for the review of specialist input in EIA processes (Keatimilwe & Ashton, 2005)*. Key considerations included:

- Ensuring that the specialists have adequately addressed IAPs' issues;
- Ensuring that the specialists' input is relevant, appropriate and unambiguous; and
- Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

The information obtained from the respective Specialist Studies was incorporated into the EIA report in the following manner:

8. The assumptions and limitations identified in each study were included in Section 9;
9. The information was used to complete the description of the receiving environment (Section 12) in a more detailed and site-specific manner;
10. A summary of each specialist study is contained in the sub-sections to follow (Sections 13.1 – 13.7), focusing on the approach to the study, key findings and conclusions drawn;
11. The Specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment contained in Section 14;

12. The evaluations performed by the specialists on the alternatives of the project components were included in the comparative analysis (Section 15) to identify the most favourable option;
13. Specialist input was obtained to address comments made by IAPs that related to specific environmental features pertaining to each specialist discipline; and
14. Salient recommendations made by the specialists were taken forward to the EIA Conclusions and Recommendations (Section 17).

13.2 Terrestrial Ecological Impact Assessment

The key issues and triggers identified during Scoping for the Terrestrial Ecological Impact Assessment include:

- Species with a known conservation status occur in the project area;
- Potential loss of significant flora and fauna species;
- Impacts to sensitive terrestrial ecological features; and
- Management actions for controlling exotic vegetation.

Table 14: Details of the Ecological Specialist

Organisation	Name	Qualifications	No. of years experience	Affiliation (if applicable)
Nemai Consulting	Mr. Ronald Phamphe	MSc Botany	7	<ul style="list-style-type: none"> • Professional Natural Scientist-Ecological Science (Reg number: 400349/12) with South African council for Natural Scientific Professions (SACNASP) • Professional member of South African Institute of Ecologists and Environmental Scientists (SAIEES) • Professional member of South African Association of Botanists (SAAB)

This section provides a summary of the Terrestrial Ecological Impact Assessment (Nemai Consulting, 2016b), as contained in **Appendix F1**.

The objectives of the study included:

- To apply relevant literature to determine the diversity and eco-status of the plants, mammals, birds, reptiles and amphibians along the proposed development site;
- To carry out a field surveys to gain an understanding of the diversity and eco-status of taxa which inhabit the proposed study area, as well as the presence of unique habitats that might require further investigation or protection;

- To assess the current habitat and conservation status of plant and animal species on the study site;
- To comment on ecological sensitive species/areas;
- To assess the possible impact of the proposed project on these taxa and/or habitats;
- To list the species on site and to recommend necessary actions in case of occurrence of endangered, vulnerable or rare species or any species of conservation importance; and
- To provide management recommendations to mitigate negative and enhance positive impacts along the proposed development site.

An Ecological Assessment was undertaken as part of the EIA process in order to assess the impacts that the proposed development will have on the receiving environment.

The study area falls within the grassland biome. The Grassland biome has a high biodiversity, ranked only below the Fynbos biome in terms of biodiversity in South Africa. It is found mainly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. Grasslands are dominated by a single layer of grasses. Trees are absent, except in a few localised habitats and geophytes are often abundant. Mucina and Rutherford (2006) classified the proposed development as falling within the Bloemfontein Dry Grassland vegetation unit, listed as Endangered. According to data sourced from South African National Biodiversity Institute (SANBI), one Threatened Terrestrial Ecosystem was recorded within the proposed development site- The Bloemfontein Dry Grassland. This ecosystem is listed as Vulnerable.

The proposed development has been transformed due to agricultural activities, human settlements and footpaths. The only areas not highly transformed is around the koppies. Due to the displacement of indigenous vegetation, this area is totally transformed and does not resemble the species composition of natural vegetation. As to be expected the species richness is relatively low and consists of a high proportion of weedy and invasive species. The extent of this habitat unit was also identified using topographical maps of the area as well as Google Earth ® imagery. One Orange-Listed Data plant species was recorded on site, namely *Boophane disticha* (Century plant). This species is listed as Declining and so, prior to construction, it must be removed and replanted during rehabilitation process.

Mammals are sensitive to disturbances and as such few were expected to occur along the proposed mixed-use development. Only five mammal species were recorded on site during the field assessment-namely House rat, Ground squirrel, Yellow Mongoose, Mole-rat and Rock Hyrax Ground. This could be attributed to anthropogenic disturbances observed on site such as human activities. The species recorded have a wide distribution range and associated with human habitation. No Red Data mammal species were recorded.

Conservation and planning tools were reviewed for relevancy in terms of the project area, and it was found that the study area did not contain or form part of any Important Bird Area (IBA) but the closest one is situated approximately 42km away, namely Soetdoring Nature Reserve IBA. Bird species recorded (20) during the field survey were common and widespread and no Red Data bird species were observed on the study site.

Large areas surrounding the site have resulted in increased habitat modification and transformation as well as increased human presence and associated disturbances (illegal reptile collecting, indiscriminate killing of all snake species, frequent fires) surrounding the site coupled with increased habitat destruction and disturbances on the neighbouring properties are all causal factors in the alteration and disappearance of reptile diversity in the area. Only six reptile species were noted on site. Due to the presence of termite mounds on site, the probability of finding the Rare Striped Harlequin Snake are higher. During construction, special attention should be paid to the presence on this species on site and should it be found, it has to be rescued on site to suitable areas.

The surface water on site are probably important breeding habitat for most of the frog species which could occur at the site. During the field assessment, two frog species were noted on site, namely Bubbling Kassina and Common Platanna. These species are very common and widespread, especially in grasslands. The Giant Bullfrog (*Pyxicephalus adspersus*) is known to occur in the study area and is currently assigned a Near-Threatened status, according to the IUCN Red List category. Globally, *P. adspersus* is listed as Least Concern.

From a broad and preliminary evaluation of the site in question, it is evident that the proposed development will have minimal impacts on the receiving environment. Two layout alternatives were considered and there is no ecological preference between the alternatives. From an ecological perspective, the proposed development should proceed subject to the above, and mitigation measures must be employed to minimise potential impacts from the project.

13.3 Wetland and Aquatic Impact Assessment

The key issues and triggers identified during Scoping for the Wetland and Aquatic Impact Assessment included:

- Impacts during construction in terms of the potential watercourse crossings;
- Loss of habitat for aquatic biota;
- Loss of riparian habitat;
- Proliferation of aquatic weeds; and
- Impacts to protected fauna and flora species (aquatic and riparian) and sensitive ecosystems.

Table 15: Details of the Aquatic/Wetland Specialist

Organisation	Name	Qualifications	No. of years experience
Sustainable Development Projects	Mr. Alex Whitehead	BSc (Hons) Ichthyology and Fisheries Science	10

This section provides a summary of the Wetland and Aquatic Impact Assessment (SDP, 2015), as contained in **Appendix F2**.

The aim of the study was to undertake an aquatic assessment and wetland delineation of the study area. The following was undertaken during the course of this study:

1. A desktop review of the study area and the aquatic/wetland habitats and, utilizing aerial imagery, available literature and Geographic Information System (GIS) data.
2. A riparian and wetland habitat delineation and assessment of watercourses and wetlands within 500m of the proposed activity
3. The undertaking of a riparian and aquatic health survey to determine the PES of the watercourses.
4. Assessment of ecological impacts as a result of the proposed development and construction activities.

Although the intention was to undertake a detailed wetland delineation and aquatic impact assessment (including a Present Ecological State – PES - assessment) this could not be done due to the lack of a natural watercourse system. As such a site visit was undertaken where by evidence was collected illustrating the artificial nature of the “drainage systems” present.

A number of small contour dams or impoundments, berms and furrows designed to catch surface flow during high precipitation rainfall events were noted on site. These structures do not align with existing low points and are entirely engineered to retain surface flows. Surface runoff was supplemented by two artificial sources – a stand pipe and a broken pipe – and these were responsible for the unusual amount of water noted on site. A series of recent Google Earth images has been provided that clearly shows the effect these artificial water sources have had on the site. It is estimated that the supplementary water flow began sometime during 2012 and has since kept certain portions of the site more verdant. Apart from furrows and courses carved by the artificial water flow, no natural watercourse channels were noted.

Some of the dams displayed weak hydromorphic soils and hygrophilous vegetation, however under natural conditions they would not be present do to a lack of natural water supply and the attenuating effect of the berms. No evidence of other natural water sources that could sustain the conditions (e.g. ground water seepage) were noted on site. As such, no natural wetland systems occur on site. The artificial systems identified are of limited ecological

significance, as they are not linked to a natural system. Apart from the intermittent appearance of semi aquatic fauna (eg *Afrana* spp) when water is present and limited hygrophilous vegetation has emerged, these impoundments cannot support a functioning aquatic ecosystem.

NFEPA identified one of the onsite dams as an “artificial wetland”. No other NFEPA wetland areas occur within 500 m of the site. Apart from the other minor berms, furrows and other small artificial dams noted on site, no wetlands or watercourses were noted within 500 m of the site.

Due to the artificial nature of the berms, furrows and small impoundments on site and their limited ecological significance, there is no definitive need to protect the systems from an ecological perspective. However, the system of artificial berms, furrows and impoundments could be useful for controlling stormwater or supplementing any open space system. The discharge of stormwater from site may alternatively, be engineered to evacuate into adjacent stormwater infrastructure which lies to the south of the site. Such stormwater will eventually evacuate into an existing impoundment at Lourierpark, which in turn discharges into agricultural irrigation canals.

No definitive mitigation measures are anticipated. The systems of berms, buffers and impoundments could be incorporated into the landscaping scheme from an aesthetic perspective or incorporated into the stormwater disposal system.

No natural watercourses or wetlands were noted on site. A series of furrows, berms and small impoundment features were noted, these being originally designed to decelerate and store surface runoff for livestock management purposes. In recent times, supplementary water from two artificial sources has maintained an unnaturally voluminous amount of water on site. It is proposed that these artificial sources are maintained as an aberrant source of water for livestock present on site.

Because of the artificial nature of the furrows, berms and impoundments situated on site, these systems can be considered to be limited ecological importance and do not support a functional aquatic ecosystem. As such, there is no ecological requirement to protect these facilities. However such structures could be retained for aesthetic or stormwater disposal purposes, if seen to be feasible from an engineering or town planning perspective.

13.4 Visual Impact Assessment

The key issues and triggers identified during Scoping for the Visual Impact Assessment include:

- Visual impacts associated with project infrastructure; and
- Impacts to the visual quality and sense of place of the project area.

Table 16: Details of the Visual Specialist

Organisation	Name	Qualifications	No. of years experience
Axis Landscape Architecture	Mr. Gerhard Griesel	Masters Degree In Landscape Architecture	8

This section provides a summary of the Visual Impact Assessment (Axis Landscape Architecture, 2015), as contained in **Appendix F3**.

The approach to the Visual Impact Assessment included the following:

- The extent of the study area was limited to a radius of 5 km;
- The site was visited to establish a photographic record of the site, views and areas of particular visual quality and or -value;
- The project components and activities were described and assessed as elements that may cause visual and landscape impacts;
- The receiving environment was described in terms of its prevailing landscape- and visual character;
- Landscape- and visual receptors that may be affected by the proposed project were identified and described;
- The sensitivity of the landscape- and visual receptors was assessed;
- The severity of the landscape- and visual impacts was determined;
- The significance of the visual and landscape impacts was assessed; and
- Mitigation measures were proposed to reduce or alleviate adverse impacts.

The three landscape types that occur in the study area are:

- Pelisier Residential; and
- Bloemdal Agricultural; and
- Brandkop Grassland

All three landscape types have very similar topographical characteristics but are distinguished due to the difference in land use.

Visual character is based on human perception and the observer's response to the relationships between and composition of the landscape, the land uses and identifiable elements in the landscape. The description of the visual character also includes an assessment of the scenic attractiveness regarding those landscape attributes that have aesthetic value and contribute significantly to the visual quality of the views; vistas and/or viewpoints of the study area.

Visual quality is a qualitative evaluation of the composition of landscape components and their influence on scenic attractiveness. The visual quality was individually assessed for the

three landscape types, which includes the area within 5 km from the proposed site. The evaluation is summarised in **Table 17**.

Table 17: Visual Quality of the regional landscape

Landscape Type	Vividness	Intactness	Unity	Visual Quality
Pelisiër Residential	3	4	3	Moderately Low
Bloemdal Agricultural	3	4	3	Moderately Low
Brandkop Grassland	4	4	4	Moderate

Landscape receptors are those defined landscapes or landscape components that contribute positively to the landscape character and that will be affected by the proposed project.

The following landscape receptors will be affected by the development:

- Grassveld and vegetation patterns of the proposed site; and
- Slopes and Rocky Outcrops on the proposed site.

Viewer groups are a collection of viewers that are involved with similar activities and experience similar views of the proposed development. Viewer groups identified within the study area are the following:

- Residents;
- Recreational users/Tourists; and
- Motorists.

The anticipated impacts include the following:

- Landscape impacts -
 - Loss of grassveld during construction;
 - Alteration to existing tributaries and dams;
 - Change in surface cover;
- Visual impacts -
 - Residents;
 - Recreational users/Tourists; and
 - Motorists.

13.5 Agricultural Impact Assessment

The key issues and triggers identified during Scoping for the Agricultural Impact Assessment include:

- Impact to high potential agricultural land;
- Loss of fertile soil, cultivated areas and grazing land on the site; and
- Disruptions to farming practices during construction.

Table 18: Details of the Agricultural Specialist

Organisation	Name	Qualifications	No. of years experience
Index	Dr Andries Gouws	PhD Integrated Land Use Modelling	29

This section provides a summary of the Agricultural Impact Assessment (Index, 2015), as contained in **Appendix F4**.

The present land use of the site consists of grazing (221.7 Ha), rubbish dumping (6.4 Ha) and cultivated land (30.2 Ha). The 30.2 Ha that is cultivated is leased from the Municipality. The grazing land is used by Brandkop Livestock for sheep, cattle, goat, pig and poultry in an agreement with the Mangaung Municipality.

Potential for agriculture ultimately describes the ability of a land parcel to produce food or fibre. It is also linked to income generation for the landowner. For this site, the soil depth is generally shallow with none or low arable potential.

There will only be a temporary impact on farming during the construction period. The nett farm income is estimated at R114 486 per year. From this, all overheads like taxes, rentals, insurances, etc., must be paid. In conclusion, the farm is not commercially viable. However, assuming that the land is leased and forms part of another farm enterprise, then the loss of income will be as follows:

1. Arable land: The loss in fodder value is estimated at R185 400, assuming rental is free.
2. Brandkop Livestock: Income from livestock is estimated at R64 640, assuming family farmers and no additional labour or overhead costs.

There were no signs of farming activity on the property during the site visit; one would see dung or signs of animal movement, or pig sties or housing for poultry. There was no evidence of any of these, which indicates that the property has not been used for some time. The reason for this is likely that the land is so degraded and fodder value so low that the farmers could gain little benefit from farming the land. The potential value is, however, R64 640. Moving Brandkop Livestock to another farm with better grazing capacity would be to their benefit.

The development will see the loss of 256 hectares of low potential agricultural land. Although the land is now vacant, the potential loss in gross income from farming is estimated at R64 650 per year. Assuming that the farmer employs 4 labourers at minimum wage of R2 607 per month, then the nett farm income will be R114 486 per year, before repayment of loans and entrepreneurs remuneration. The farm is not a viable unit and its loss to the development will not lead to loss of high or medium potential land.

From an agricultural perspective, there is no preference in layout, the loss of land to agriculture will be similar in both instances. There is no long-term impact on farming on a regional level; the property is not a viable farming unit. The main impact to the adjoining farms is the nuisance value during construction. The financial loss is less than R114 486 per year before overhead costs. The overhead cost is likely to exceed in nett farm income. It is the view of the author, as an independent consultant, that the construction should be allowed.

13.6 Phase 1 Heritage Impact Assessment

The key issues and triggers identified during Scoping for the Phase 1 HIA include:

- The size of the area;
- Potential occurrence of heritage resources, graves and structures older than 60 years within project footprint; and
- Heritage significance of the project area.

Table 19: Details of the Heritage Specialist

Organisation	Name	Qualifications	No. of years experience
Private	Mr. Cobus Dreyer	M.A. Archaeology	18

This section provides a summary of the Phase 1 HIA (Dreyer, 2015), as contained in **Appendix F5**.

A first phase archaeological and heritage assessment was undertaken as part of the EIA process to assess the impacts of the proposed development.

The original farmyard contains several historical buildings, which date from about 1876, or even earlier. Other remains of previous farming activities occur in the form of corrugated iron buildings, concrete foundations, several water reservoir dams, irrigation furrows, stone steps and terrace walls. The farm used to be part of an important historical period in the history of Bloemfontein. None of the buildings on the property is declared National Monuments. According to inscriptions on a gable of the main residence, the original house was erected in 1876 and was renovated and extended in 1919, with more alterations added through the years. The first occupants planted many trees, of which some are still growing. The farmyard lies outside the proposed developments and will not be affected by the present project.

A graveyard near the farmhouse contains the burials of members of the Fichardt-family, the first occupants, who were all former prominent citizens of Bloemfontein. Little is known about the impact of the Anglo-Boer War (1899-1902) activities at Brandkop. General French and his Rimington Scouts immediately took possession of the farm on their approach to occupy Bloemfontein. Schoeman (1980) relates that the Fichardt-family retreated to their town

residence in Bloemfontein and their daughters were sent to Cape Town. By investigations during several site visits, I could not find any proof of the presence of the British troops in the form of fired British ,303-inch calibre rifle cartridge cases or food tin remains dating from the Anglo-Boer War.

The new development will not affect the old farmyard and will have no impact on the cultural heritage and historical environment of the area. It is recommended that the proposed plans may proceed and further planning of the project may continue. No mitigation measures will be needed. As a precautionary measure, in case of contractors accidentally finding any potential heritage items such as graves or ash heaps, the work must stop and the Heritage Specialist should be notified about the finds.

13.7 Phase 1 Palaeontological Impact Assessment

The key issues and triggers identified during Scoping for the Phase 1 Palaeontological Impact Assessment include:

- The SAHRIS paleontological sensitivity map indicates that the sensitivity of part of the site is very high.

Table 20: Details of the Palaeontological Specialist

Organisation	Name	Qualifications	No. of years experience
Paleo Field Services	Lloyd Rossouw	PhD Palaeobotany	20

This section provides a summary of the Palaeontological Impact Assessment (Paleo Field Services, 2015), as contained in **Appendix F6**.

A Phase 1 Palaeontological Impact Assessment was carried out on a portion of land marked for the proposed development of a new residential area on the farm Brandkop 702 outside Bloemfontein, Free State Province. The development footprint is situated within the Beaufort Group (Karoo Supergroup), and is underlain by palaeontologically significant, late Permian, Adelaide Subgroup sedimentary rocks, that have been widely intruded by Jurassic-age dolerites. The dolerite component (Jd) is not palaeontologically vulnerable and the likelihood of impact on palaeontological remains in the vicinity of igneous outcrop is considered unlikely. The koppies, koppie slopes and zones immediately adjacent are assigned a field rating of Generally Protected C (GP.C). The likelihood of impact on palaeontological material from fresh sedimentary bedrock strata, which may occur further away from the koppies is considered low, but if *in situ* fossil material is exposed as a result of excavations into fresh sedimentary bedrock, it should be reported to SAHRA and a professional palaeontologist as soon as possible. The capped sedimentary bedrock component that is potentially unaffected

by dolerite intrusions is assigned a field rating of Generally Protected B (GP.B). It is unlikely that the proposed development will affect palaeontological heritage resources within the superficial component (Quaternary overburden) due to the disturbed condition of the substrate and the absence of suitable Quaternary-aged alluvial contexts within the boundaries of the footprint. The palaeontological significance of the Quaternary overburden along the proposed footprint is therefore considered to be very minor. The proposed footprint is assigned a field rating of Generally Protected C (GP.C).

14 IMPACT ASSESSMENT

14.1 Overview

This section focuses on the pertinent environmental impacts that could potentially be caused by the proposed Brandkop Mixed-Use Development during the pre-construction, construction and operational phases of the project.

An 'impact' refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity. Impacts were identified as follows:

- Impacts associated with listed activities contained in GN No. R. 544, R. 545 and R. 546 of 10 June 2010, for which authorisation has been applied for;
- An appraisal of the project activities and components;
- Issues highlighted by environmental authorities;
- Comments received during public participation;
- An assessment of the receiving biophysical, social, economic and technical environment; and
- Findings from Specialist Studies.

14.1.1 Impacts Associated with Listed Activities

As mentioned, the project requires authorisation for certain activities listed in the EIA Regulations (2014), which serve as triggers for the environmental assessment process. The potential impacts associated with the key listed activities are broadly stated in **Table 21**.

Table 21: Impacts associated with the Listed Activities

GN	Activity	Description as per GN	Potential Impact Overview
GN R. 544	9 (i) and (ii)	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage 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 facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	<ul style="list-style-type: none"> • Impacts associated with the footprint of the physical infrastructure within 32 m of a watercourse. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside watercourses. • Destabilisation of affected watercourses. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species).
	11 (iv)(ix)(xi)	The construction of: (iv) dams, (ix) spillways, and (xi) infrastructure exceeding 50 m ² in size, where such construction occurs within a watercourse or 32m of a watercourse	
	18 (i)	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 from- a watercourse	<ul style="list-style-type: none"> • Construction activities (including bulk earthworks) to be undertaken within a watercourse for physical infrastructure. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside the watercourse. • Destabilisation of affected watercourses.
	56	Phased activities for all activities listed in this Schedule, which commence on or after the effective date of this Schedule, where any one phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold	<ul style="list-style-type: none"> • Impacts associated with type of phased activities. • Cumulative impacts.

GN	Activity	Description as per GN	Potential Impact Overview
GN R. 545	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;	<ul style="list-style-type: none">• Clearance of large areas of indigenous vegetation associated with the construction footprint.• Potential loss of sensitive fauna and flora species.

14.1.2 Environmental Activities

In order to understand the impacts related to the project it is necessary to unpack the activities associated with the project life-cycle (refer to Section 6.2), as done in the sub-sections to follow.

14.1.2.1 Project Phase: Pre-construction

The main project activities as well as high-level environmental activities undertaken in the pre-construction phase are listed in **Table 22**.

Table 22: Activities associated with Pre-construction Phase

Pre-construction Phase	
Project Activities	
1.	Negotiations and agreements with the affected landowner (Mangaung Municipality), stakeholders and authorities
2.	Initiate legal process required for land acquisition
3.	Detailed engineering design
4.	Detailed geotechnical investigations
5.	Survey and mark construction servitude
6.	Survey and map topography for determination of post-construction landscape, rehabilitation and shaping (where necessary)
7.	Procurement process for Contractors
8.	Development and approval of method statements
9.	Building of Site Office and Site Camp
Environmental Activities	
10.	Diligent compliance monitoring of the EMP, environmental authorisation and other relevant environmental legislation
11.	Undertake a walk through survey of the project footprint by the relevant environmental specialists to identify sensitive environmental features
12.	Develop environmental monitoring programme
13.	Develop Search, Rescue and Relocation Management Plan, based on findings of walk through survey
14.	Barricading of sensitive environmental features
15.	Establish Environmental Monitoring Committee (EMC)
16.	On-going consultation with IAPs

14.1.2.2 Project Phase: Construction

The main project activities as well as high-level environmental activities undertaken in the construction phase are listed in **Table 23**.

Table 23: Activities associated with Construction Phase

Construction Phase	
Project Activities	
1. Site establishment	
2. Establish construction laydown area	
3. Delivery of construction material	
4. Transportation of equipment, materials and personnel	
5. Storage and handling of material	
6. Construction employment	
7. Site clearing	
8. Excavation	
9. Blasting	
10. Construction of development	
11. Mechanical and electrical works	
12. Cut and cover activities	
13. Stockpiling	
14. Waste and wastewater management	
Environmental Activities	
15. Diligent compliance monitoring of the EMP, environmental authorisation and other relevant environmental legislation	
16. Ongoing search, rescue and relocation of red data, protected and endangered species, medicinal plants, heritage resources and graves (based on area of influence of the construction activities) – permits to be in place	
17. Implement environmental monitoring programme	
18. Reinstatement and rehabilitation of construction domain (outside of inundation areas, as necessary)	
19. Convene EMC Meetings	
20. On-going consultation with IAPs	

14.1.2.3 Project Phase: Operation

The main project activities as well as high-level environmental activities undertaken in the operation phase are listed in **Table 24**.

Table 24: Activities associated with Operation Phase

Operation Phase
Project Activities
1. Maintenance of infrastructure
2. Operation of mixed-use development
Environmental Activities
3. Erosion monitoring programme
4. On-going consultation with IAPs

14.1.3 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact. The following environmental aspects have been identified for the proposed development of Brandkop Mixed-Use Development, which are linked to the project activities (note that only high level aspects are provided):

Table 25: Environmental Aspects associated with Project Life-Cycle

Environmental Aspects
Pre-construction Phase
1. Inadequate consultation with landowners/occupiers of land
2. Inadequate environmental and compliance monitoring
3. Poor construction site planning and layout
4. Land occupancy by temporary buildings, provisional on-site facilities and storage areas
5. Inaccurate pre-construction environmental walk through survey (including search and rescue)
6. Absence of relevant permits (e.g. for protected trees, heritage resources)
7. Lack of barricading of sensitive environmental features
8. Poor waste management
9. Absence of ablution facilities
Construction Phase
1. Inadequate consultation with landowners/occupiers of land
2. Inadequate environmental and compliance monitoring
3. Lack of environmental awareness creation
4. Indiscriminate site clearing

Environmental Aspects
5. Poor site establishment
6. Poor management of access and use of access roads
7. Inadequate provisions for working on steep slopes
8. Poor transportation practices
9. Poor fencing arrangements
10. Erosion
11. Disruptions to existing services
12. Disturbance of topsoil
13. Poor management of excavations
14. Inadequate storage and handling of material
15. Inadequate storage and handling of hazardous material
16. Poor maintenance of equipment and infrastructure
17. Poor management of labour force
18. Pollution from ablution facilities
19. Inadequate management of construction camp
20. Poor waste management practices – hazardous and general solid, liquid
21. Wastage of water
22. Disturbance to landowners/occupiers of land
23. Poor management of pollution generation potential
24. Damage to significant flora (if encountered)
25. Damage to significant fauna (if encountered)
26. Environmental damage of sensitive areas
27. Disruption of archaeological and cultural features (if encountered)
28. Poor reinstatement and rehabilitation
Operation Phase
1. Inadequate consultation with landowners/occupiers of land
2. Inadequate environmental and compliance monitoring
3. Inadequate management of access, routine maintenance and maintenance works
4. Inadequate management of vegetation

14.1.4 Issues raised by Environmental Authorities and IAPs

The issues raised by authorities (both regulatory and commenting) and IAPs during meetings and contained in correspondence received to date during the execution of the EIA are captured and addressed in the Comments and Responses Report (**Appendix K**). The main comments are summarised below:

- A similar development (mixed-use) is planned to take place adjacent to the proposed site.
- DWS requested the watercourses on site to be delineated including the 1:100 year floodlines. However, the Aquatic and Wetland Specialist found no true watercourses on site and thus a WULA in terms of NWA is not applicable.
- MMM were concerned about the impacts on the ridges / “koppies” on the site.
- MMM requested that a Relocation Plan be developed for the current livestock farmers on the site.

These issues received further attention during the investigations in the EIA phase, including the environmental and technical Specialist Studies.

14.1.5 Potential Significant Environmental Impacts

Note that it is not the intention of the impact assessment to evaluate all potential environmental impacts associated by the project’s environmental aspects, but rather to focus on the potentially significant direct and indirect impacts identified during the Scoping phase and any additional issues uncovered during the EIA stage.

The potential significant environmental impacts associated with the project, as listed in **Table 26** (construction phase) and **Table 27** (operational phase), were identified through an appraisal of the following:

- Project-related components and infrastructure (Section 6.1);
- Activities associated with the project life-cycle (i.e. pre-construction, construction, operation and decommissioning) (Section 6.);
- Proposed alternatives to project components (Section 11);
- Nature and profile of the receiving environment and potential sensitive environmental features and attributes (Section 12), which included a desktop evaluation (via literature review, specialist input, GIS, topographical maps and aerial photography) and site investigations;
- Findings from Specialist Studies (Section 13);
- Understanding of direct and indirect effects of the project as a whole (Section 14);
- Input received during public participation from authorities and IAPs (Section 16); and
- Legal and policy context (see Section 7).

Table 26: Potential Significant Environmental Impacts during Construction Phase

Environmental Factor	Potential Issues/Impacts
Climate	<ul style="list-style-type: none"> • Greenhouse gas emissions
Geology and Soil	<ul style="list-style-type: none"> • Unsuitable geological conditions • Sourcing of construction material • Blasting

Environmental Factor	Potential Issues/Impacts
	<ul style="list-style-type: none"> Disposal of spoil material
Terrestrial Ecology - Flora	<ul style="list-style-type: none"> Impacts to sensitive terrestrial ecological features Potential loss of significant flora species Damage / clearance of habitat of conservation importance Proliferation of exotic vegetation Loss of medicinal plants
Terrestrial Ecology - Fauna	<ul style="list-style-type: none"> Potential loss of significant fauna species Damage / clearance of habitat of conservation importance
Land Capability	<ul style="list-style-type: none"> Loss of grazing land within construction domain Disruptions to farming operations Loss of fertile soil through land clearance
Heritage Resources	<ul style="list-style-type: none"> Disturbance and possible destruction of heritage resources
Air Quality	<ul style="list-style-type: none"> Excessive dust levels
Noise	<ul style="list-style-type: none"> Localised noise increase
Access Roads	<ul style="list-style-type: none"> Increased construction related traffic on local roads Decreased visibility along roads due to poor dust management
Waste Management	<ul style="list-style-type: none"> Waste generated from site preparations Domestic waste Surplus and used building material Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags) Wastewater (sanitation facilities, washing of plant, operations at the batching plant, etc.) Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks
Visual Aesthetics	<ul style="list-style-type: none"> The sense of place will be adversely affected through the various activities associated with the construction phase as well as the permanent project components during the operational phase.
Socio-Economic Environment	<ul style="list-style-type: none"> Increased employment opportunities (positive) Increased economic opportunities in the area (positive) Increased potential for increased land invasions Loss of land within construction domain Impact to visual quality and sense of place Nuisance from noise and dust Safety and security

Table 27: Potential Significant Environmental Impacts during Operation Phase

Environmental Factor	Potential Issues/Impacts
Climate	<ul style="list-style-type: none"> Greenhouse gas emissions
Geology and Soil	<ul style="list-style-type: none"> Soil erosion on steep slopes (e.g. re-aligned access road, pipeline route) Unsuitable geological conditions
Topography	<ul style="list-style-type: none"> Visual impact to river valleys
Terrestrial Ecology - Flora	<ul style="list-style-type: none"> Impacts to sensitive terrestrial ecological features Potential loss of significant flora species Proliferation of exotic vegetation

Environmental Factor	Potential Issues/Impacts
	<ul style="list-style-type: none"> Loss of medicinal plants
Terrestrial Ecology - Fauna	<ul style="list-style-type: none"> Potential loss of significant fauna species
Land Capability	<ul style="list-style-type: none"> Permanent loss of fertile soil through land clearance Permanent loss of grazing land within construction domain
Heritage Resources	<ul style="list-style-type: none"> Loss of heritage resources
Access Roads	<ul style="list-style-type: none"> Increased traffic on local roads
Visual Aesthetics	<ul style="list-style-type: none"> The sense of place will be adversely affected by the Brandkop Mixed-Use Development.
Socio-Economic Environment	<ul style="list-style-type: none"> Impact to visual quality and sense of place Improved economic potential of the area Improved social and community services in the area

The cumulative impacts are discussed in Section 14.19.

The findings of the Specialists are of particular importance in terms of understanding the impacts of the project and managing these during the project life-cycle, as these studies focused on the significant environmental issues identified during the execution of the EIA.

14.1.6 Impact Assessment Methodology

The impacts and the proposed management thereof are first discussed on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts (refer to methodology provided in **Table 28**). The assessment considers impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

Table 28: Impact Methodology Table

Nature			
Negative	Neutral	Positive	
-1	0	+1	
Extent			
Local	Regional	National	International
1	2	3	4
Magnitude			
Low	Medium	High	
1	2	3	
Duration			
Short Term (0-5yrs)	Medium Term (5-11yrs)	Long Term	Permanent
1	2	3	4

Probability				
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain
1	2	3	4	5
Significance				
No Impact/None	No Impact After Mitigation/Low	Residual Impact After Mitigation/Medium	Impact Cannot be Mitigated/High	
0	1	2	3	

The following definitions apply:

Nature (/Status)
The project could have a positive, negative or neutral impact on the environment.
Extent
<ul style="list-style-type: none"> Local – extend to the site and its immediate surroundings. Regional – impact on the region but within the province. National – impact on an interprovincial scale. International – impact outside of South Africa.
Magnitude
Degree to which impact may cause irreplaceable loss of resources. <ul style="list-style-type: none"> Low – natural and social functions and processes are not affected or minimally affected. Medium – affected environment is notably altered; natural and social functions and processes continue albeit in a modified way. High – natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.
Duration
<ul style="list-style-type: none"> Short term – 0-5 years. Medium term – 5-11 years. Long term – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention. Permanent – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability
<ul style="list-style-type: none"> Almost certain – the event is expected to occur in most circumstances. Likely – the event will probably occur in most circumstances. Moderate – the event should occur at some time. Unlikely – the event could occur at some time. Rare/Remote – the event may occur only in exceptional circumstances.
Significance
Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows- <ul style="list-style-type: none"> 0 – Impact will not affect the environment. No mitigation necessary. 1 – No impact after mitigation. 2 – Residual impact after mitigation. 3 – Impact cannot be mitigated.

The following scoring system applies:

$$\text{Overall Score} = (N \times M \times S) \times (E + D + P)$$

For example, the worst possible impact score of -117 would be achieved based on the following ratings:

N = Nature = -1

M = Magnitude = 3

S = Significance = 3

E = Extent = 4

D = Duration = 4

P = Probability = 5

$$\text{Worst impact score} = (-1 \times 3 \times 3) \times (4 + 4 + 5) = -117$$

On the other hand, if the nature of an impact is 0 (neutral or no change) or the significance is 0 (no impact), then the impact will be 0.

Impact Scores will therefore be ranked in the following way:

Table 29: Ranking of Overall Impact Score for Impact Assessment

Impact Rating	Low/Acceptable	Medium	High	Very High
Score	0 to -30	-31 to -60	-61 to -90	-91 to -117

In the case of the Specialist Studies, some of the impact assessment methodologies deviated from the approach shown in **Table 28**. However, the quantitative basis for these specialist evaluations of the impacts to specific environmental features still satisfied the intention of the EIA.

14.1.7 Impact Mitigation

14.1.7.1 Mitigation Hierarchy

Impacts are to be managed by assigning suitable mitigation measures. According to DEAT (2006), the objectives of mitigation are to:

- Find more environmentally sound ways of executing an activity;
- Enhance the environmental benefits of a proposed activity;
- Avoid, minimise or remedy negative impacts; and
- Ensure that residual negative impacts are within acceptable levels.



Figure 35: Mitigation Hierarchy

Prevention mitigation measures (1) are the first preference for developments and are usually measures that avoid impacts completely. The impacts for the mitigation measures listed below will mostly fall under the reduction hierarchy (2). This involves mitigation measures that minimise impacts. This EMPr also includes remediation and rehabilitation measures (hierarchy 3) for environmental impacts. Compensation (4) involves compensating the loss of an entire feature. In the case for the environment, this usually means consideration of an off-set associated with rehabilitation and mitigation.

The basis for the management measures which follow below comprise of the following:

- Management objectives – i.e. desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources);
- Targets – i.e. level of performance to accomplish management objectives; and
- Management actions– i.e. practical actions aimed at achieving management objectives and targets;
- Responsibilities; and
- Monitoring requirements.

The proposed mitigation of the impacts associated with the project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. Note that the mitigation measures in the subsequent sections are not intended to be exhaustive, but rather focus on the potentially significant impacts identified.

The EMPr (**Appendix G**) provides a comprehensive list of mitigation measures for specific elements of the project, which extends beyond the impacts evaluated in the body of the EIA Report.

14.1.7.2 EMPr

An EMPr represents a detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

The EMPr aims to satisfy the requirements stipulated in Section 31(2)(p) of GN. No. R. 543 (10 June 2010) and Appendix 4 of GN No. R. 982 (04 December 2014).

The scope of the Brandkop Mixed-Use Development EMPr is as follows:

- Establish management objectives during the project life-cycle in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMPr;
- Provide legislative framework; and
- Description of requirements for record keeping, reporting, review, auditing and updating of the EMPr.

All liability for the implementation of the EMPr (as well as the EIA findings and environmental authorisation) lies with the project proponent (i.e. Mangaung Municipality).

14.2 Climate

14.2.1 Potential Impacts

During the operation of the Brandkop Mixed-Use Development, an increase in greenhouse gas releases will occur. Greenhouse gases are produced by various impacts including the fossil fuels and building materials used during construction.

14.2.2 Impact Assessment

Climate							
Project Life-cycle:	Construction						
Potential Impact:	Greenhouse gas emissions (such as from building materials and vehicle emissions)						
Proposed Mitigation:	<ul style="list-style-type: none"> • Materials with a high recycled content should be used where possible and the re-use of site materials should be considered. • In terms of transportation of workers and materials, collective transportation arrangements should be made to reduce individual car journeys. • All vehicles used during the project should be properly maintained and in good working order. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Regional	Medium	Medium	Likely	2	-32
With Mitigation	-	Regional	Low	Medium	Likely	1	-8

14.3 Geology and Soil

14.3.1 Potential Impacts

The Brandkop Mixed-Use Development requires suitable geological foundation conditions, which were confirmed through the Geotechnical Investigation (**Appendix M**). It is evident that the area is underlain by Adelaide Subgroup sandstones, siltstones and mudstones which has been intruded by Karoo dolerite which constitutes the capping of the koppies. Results from this investigation as well as the available information from the area indicates that the proposed development of the area, comprising a residential area, is feasible. However, a detailed Phase 2 will be required once development commences.

General recommendations with regard to founding have been given for single storey structures based on site class designation in accordance with the National Department of Housing. For heavily loaded structures, such as the proposed multi storey walk up units, adjustment of these founding solutions will be necessary in order to accommodate the structures larger footprint and load and possibly more detailed investigations will be required. General recommendations with regard to cutting and filling of the site for development have been given. In this regard, permanent cut slopes should be restricted to a batter of 1:2 in the residual and colluvial materials, but may be increased to 1:1,5 in the weathered bedrock. It is essential to understand, that the close joint sets or bedding may cause instability, when slopes are cut to an unsuitable angle or, slopes are cut where the bedding is dipping out of the slope.

Fills must be engineered using suitable materials and should be restricted to a slope batter of 1:2. Cut and fill slopes must be topsoiled and grassed as soon as possible after construction. Subsoil drainage should be installed underneath the fill embankments. Although the shallow drainage lines and seepage areas have been indicated, these areas are deemed remediable on condition that suitable site drainage is implemented for the generally level area. The subsoil condition in general are considered poor for soak pit and french drain solutions and water born sewerage systems should ideally be part of any development proposed in the future. In general, the on-site bedrock is the only suitable material source for engineered fill with all the colluvial and residual materials being considered unsuitable as fill subgrade materials.

14.3.2 Impact Assessment

Geology and Soil	
Project Life-cycle:	Construction and Operation
Potential Impact:	Soil erosion on steep slopes
Proposed	<ul style="list-style-type: none"> Stabilisation of cleared areas to prevent and control erosion. The method chosen

Mitigation:	(e.g. watering, planting, retaining structures, commercial anti-erosion compounds) will be selected according to the site specific conditions. Drainage management should also be implemented to ensure the minimization of potential erosion.						
	<ul style="list-style-type: none"> Acceptable reinstatement and rehabilitation of areas outside of FSL to prevent erosion during operation phase. Install suitable buttressing to prevent future erosion of the structures of the watercourses affected by construction, if required. Monitoring to be conducted to detect erosion. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Likely	2	-28
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

14.4 Terrestrial Ecology - Flora

14.4.1 Potential Impacts

Potential Impacts include:

- Vegetation will be lost within the site boundary.
- Impacts to sensitive terrestrial ecological features such as the ridges / “koppies”
- Potential loss of significant flora species
- Damage / clearance of habitat of conservation importance
- Proliferation of exotic vegetation
- Loss of medicinal plants

Terrestrial Ecology – Flora							
Project Life-cycle:	Pre-construction						
Potential Impact:	Loss of vegetation of conservation significance through construction activities.						
Proposed Mitigation:	<ul style="list-style-type: none"> A qualified and / or appropriately experienced Botanist or an experienced person who knows specific vegetation type well should mark any species of conservation importance and other medicinal plants on the proposed site before construction commences. Orange data listed plant and medicinal species such as <i>Boophane disticha</i> must be removed prior construction and replanted during rehabilitation process. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Almost Certain	2	-32
With Mitigation	-	Local	Low	Short	Likely	1	-6

Terrestrial Ecology – Flora							
Project Life-cycle:	Pre-construction						
Potential Impact:	Site Clearing						
Proposed Mitigation:	<ul style="list-style-type: none"> During site preparation, topsoil and subsoil are to be stripped separately from each other and must be stored separately from spoil material for use in the rehabilitation phase. It should be protected from wind and rain, as well as contamination from diesel, concrete or wastewater. Records of all environmental incidents must be maintained and a copy of these records must be made available to authorities on request throughout the project execution. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Medium	Likely	2	-42
With Mitigation	-	Local	Medium	Short	Likely	1	-12

Terrestrial Ecology – Flora							
Project Life-cycle:	Construction						
Potential Impact:	Soil contamination, vegetation loss and vegetation disturbance due to fuel and chemical spills to the surface water.						
Proposed Mitigation:	<ul style="list-style-type: none"> Employ on site personnel responsible for preventing and controlling potential soil pollution through fuel and oil leaks and spills. Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks. Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Drip-trays must be placed under vehicles and equipment when not in use. Require the suitable establishment of erosion control mechanisms. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Medium	Likely	2	-42
With Mitigation	-	Local	Medium	Medium	Likely	1	-14

Terrestrial Ecology – Flora							
Project Life-cycle:	Construction						
Potential Impact:	Vegetation and habitat disturbance due to the accidental introduction of alien species.						
Proposed Mitigation:	<ul style="list-style-type: none"> Promote awareness of all personnel. During construction activities, monitoring and control of alien weeds and invaders through hand removal; slashing (annuals) or chemical control (perennials). Chemical control may only be done upon approval from the ECO. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Medium	Likely	2	-42
With Mitigation	-	Local	Medium	Medium	Likely	1	-14

Terrestrial Ecology – Flora							
Project Life-cycle:	Construction						
Potential Impact:	Vegetation and habitat disturbance due to pollution and littering during construction phase.						
Proposed Mitigation:	<ul style="list-style-type: none"> The Contractor should employ personnel on site responsible for preventing and controlling of litter. Promote housekeeping with daily clean-ups on site. Before construction commences, construction workers should be educated with regards to littering, ad hoc veld fires, and dumping. No fires are allowed on site. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Likely	2	-28
With Mitigation	-	Local	Low	Medium	Likely	1	-7

Terrestrial Ecology – Flora							
Project Life-cycle:	Construction						
Potential Impact:	Damage to plant life outside of the proposed development site.						
Proposed Mitigation:	<ul style="list-style-type: none"> Construction activities should be restricted to the development footprint area. All workers must be trained before construction commences. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Likely	2	-28
With Mitigation	-	Local	Low	Medium	Likely	1	-7

Terrestrial Ecology – Flora							
Project Life-cycle:	Operational						
Potential Impact:	The proposed construction activities may affect biodiversity through the encroachment of exotic vegetation following soil disturbance, in addition the maintenance of the area would disturb naturalised species within the area.						
Proposed Mitigation:	<ul style="list-style-type: none"> Encroachment of alien vegetation should be monitored regularly and controlled; the area must be kept clear of all invader plants as per the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983). Rehabilitation measures must be employed until such a time as indigenous species are established. As much vegetation growth as possible should be promoted within the proposed replacement in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during landscaping. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Likely	2	-28
With Mitigation	-	Local	Low	Medium	Unlikely	1	-5

14.5 Terrestrial Ecology - Fauna

14.5.1 Potential Impacts

Potential Impacts include:

- Potential loss of significant fauna species
- Damage / clearance of habitat of conservation importance

14.5.2 Impact Assessment

Terrestrial Ecology – Fauna							
Project Life-cycle:	Pre-construction						
Potential Impact:	Loss of fauna of conservation significance through construction activities.						
Proposed Mitigation:	<ul style="list-style-type: none"> • A qualified and / or appropriately experienced Zoologist or an experienced person who knows the animals in the region well will identify any possible Red Data fauna on site and the necessary permits to relocate fauna must be obtained if avoidance is not possible. • Training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily. • Posters should be displayed on sight to sensitise workers to fauna in the region. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Unlikely	2	-20
With Mitigation	-	Local	Low	Medium	Unlikely	1	-5

Terrestrial Ecology – Fauna							
Project Life-cycle:	Pre-construction						
Potential Impact:	Site Clearing						
Proposed Mitigation:	<ul style="list-style-type: none"> • During site preparation special care must be taken during the clearing of the works area to minimise damage or disturbance of roosting and nesting sites. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Medium	Likely	2	-42
With Mitigation	-	Local	Medium	Medium	Likely	1	-14

Terrestrial Ecology – Fauna							
Project Life-cycle:	Construction						
Potential Impact:	Disturbance to animals.						
Proposed Mitigation:	<ul style="list-style-type: none"> • Animals residing within the designated area shall not be unnecessarily disturbed. • Before construction starts, construction workers must be educated with regards to 						

Terrestrial Ecology – Fauna							
	littering and poaching. <ul style="list-style-type: none"> The Contractor and his/her employees shall not bring any domestic animals onto site. Toolbox talks should be provided to contractors regarding disturbance to animals. Particular emphasis should be placed on talks regarding snakes. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Unlikely	2	-20
With Mitigation	-	Local	Low	Medium	Unlikely	1	-5

Terrestrial Ecology – Fauna							
Project Life-cycle:	Construction						
Potential Impact:	Allow for safe animal passage through and specifically out of the construction site.						
Proposed Mitigation:	<ul style="list-style-type: none"> Construction areas must be demarcated but should allow for the migration of small faunal species out of the construction zone. Fencing types must be selected for minimal disturbance to animal movement corridors (e.g. palisade fencing is preferable to diamond-mesh fencing). 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Unlikely	2	-20
With Mitigation	-	Local	Medium	Medium	Unlikely	1	-10

Terrestrial Ecology – Fauna							
Project Life-cycle:	Operational						
Potential Impact:	Disturbance of faunal species						
Proposed Mitigation:	<ul style="list-style-type: none"> The disturbance of fauna should be minimized. Animals residing within the designated area shall not be unnecessarily disturbed. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Medium	Likely	2	-28
With Mitigation	-	Local	Low	Medium	Unlikely	1	-5

14.6 Land Capability

14.6.1 Potential Impacts

There will only be a temporary impact on farming during the construction period.

Because of the harsh climate, fodder is normally supplied to livestock during winter and early spring. The grazing value of the farm is, therefore separately evaluated to the cultivated land, which is leased to a farmer. It is the practice that a cash crop is planted and that if the

season is favourable, the grain is sold and the hay used for winter animal feed. However, the soil type is not suitable to crop production and is only seen for its fodder production value. Assuming that 4 tonne of hay is cut, then the fodder value is estimated at R185 444 for the farmer (or land owner). As a sales price of R1 545 for hay, the estimated cost to replace the fodder that is produced on the 30 hectares, is about R185 400. This amount will be used in the financial calculation. The gross margin for livestock is expected to be R2 586 per LSU for a weaner production system (income of R4 800 less expenses of R2 214).

The nett farm income is estimated at R114 486 per year. From this, all overheads like taxes, rentals, insurances, etc., must be paid. In conclusion, the farm is not a commercially viable. However, assuming that the land is leased and forms part of another farm enterprise, then the loss of income will be as follows:

- 1) Arable land: The loss in fodder value is estimated at R185 400 assuming rental is free.
- 2) Brandkop Livestock: Income from livestock is estimated at R64 640, assuming family farmers and no additional labour or overhead costs.

There were no signs of farming activity on the property during the site visit; one would see dung or signs of animal movement, or pig sties or housing for poultry. There was no evidence of any of these, which indicates that the property has not been used for some time. The reason for this is likely that the land is so degraded and fodder value so low that the farmers could gain little benefit from farming the land. The potential value is, however, R64 640. Moving Brandkop Livestock to another farm with better grazing capacity would be to their benefit.

14.6.2 Impact Assessment

Land Capability							
Project Life-cycle:	Construction						
Potential Impact:	Disruptions to existing farming operations						
Proposed Mitigation:	<ul style="list-style-type: none"> • Restrict site clearing activities to construction area / domain and basin. • Adequate compensation for loss of crops, assets and farming infrastructure during construction. • In areas where livestock occur, erect fences according to appropriate specifications (depending on the type of animals that occur on the farms) for the construction camps and construction servitude to protect animals from construction-related activities. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Short	Almost Certain	3	-63
With Mitigation	-	Local	Medium	Short	Unlikely	1	-4

14.7 Heritage Resources

14.7.1 Potential Impacts

The new development will not affect the old farmyard and will have no impact on the cultural heritage and historical environment of the area.

The proposed development footprint is situated away from major alluvial water courses. It is unlikely that the proposed development will affect palaeontological heritage resources within the superficial component (Quaternary overburden) due to the disturbed condition of the substrate and the absence of suitable Quaternary-aged alluvial contexts within the boundaries of the footprint. The palaeontological significance of the Quaternary overburden within the boundaries of the proposed footprint is therefore considered to be very minor. This component is assigned a field rating of Generally Protected C. The dolerite component is not palaeontologically vulnerable and the likelihood of impact on palaeontological remains in the vicinity of igneous outcrop is considered unlikely. The likelihood of impact on palaeontological material from fresh sedimentary bedrock strata, which may occur further away from the koppies, is considered low, but if *in situ* fossil material is exposed as a result of excavations into fresh sedimentary bedrock, it should be reported to SAHRA and a professional palaeontologist as soon as possible. However, standard mitigation measures will be in place:

14.7.2 Impact Assessment

Heritage Resources	
Project Life-cycle:	Pre-construction and Construction
Potential Impact:	Destruction or damage to cultural heritage sites including structures older than 60 years, graves, etc.
Proposed Mitigation:	<p>During construction, if any heritage resources are found (chance finds) the following protocol must be followed:</p> <ul style="list-style-type: none"> • All work must stop in the vicinity of the find. • The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage. • Free State Provincial Heritage Resources Authority must be informed and a registered heritage specialist must be appointed to undertake an assessment of the find. • Depending of what is found and the significance thereof, the specialist will advise on the way forward. • If the resource needs to be removed/altered/destroyed then the necessary permit/s must be obtained from Free State Provincial Heritage Resources Authority. • Only once the specialist gives the go-ahead can work commence in the area. • Under no circumstance can heritage material be destroyed or removed from the site. • Should any remains be found that could potentially be human remains then the SAPS must be contacted.

Heritage Resources							
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Permanent	Almost Certain	3	-90
With Mitigation	-	Local	Medium	Permanent	Likely	2	-36

Palaeontology							
Project Life-cycle:	Pre-construction and Construction						
Potential Impact:	Destruction or damage to fossils unearthed during construction process						
Proposed Mitigation:	<ul style="list-style-type: none"> During construction, if <i>in situ</i> fossil material is exposed as a result of excavations into fresh sedimentary bedrock, it should be reported to SAHRA and a professional palaeontologist as soon as possible. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Permanent	Almost Certain	3	-90
With Mitigation	-	Local	Medium	Permanent	Likely	2	-36

14.8 Air Quality

14.8.1 Potential Impacts

Dust will be generated during the construction period from various sources, including blasting, aggregate stockpiles, use of access roads, transportation of spoil material, soil stockpiles and general construction activities on site.

Mitigation measures are included in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored (dust fallout and particulate matter) and managed and that regulated thresholds are not exceeded. The EMPr also includes measures to control and minimize greenhouse gas emissions by optimizing the utilisation of construction resources.

14.8.2 Impact Assessment

Air Quality	
Project Life-cycle:	Construction
Potential Impact:	Excessive dust levels as a result of construction activities
Proposed Mitigation:	<ul style="list-style-type: none"> Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area and access roads. Note that all dust suppression requirements should be based on the results from the dust monitoring and the

Air Quality							
	proximity of sensitive receptors. <ul style="list-style-type: none"> • Speed limits to be strictly adhered to. • The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties). • Air quality to be monitored (baseline and during construction) for dust fallout and particulate matter. Sampling locations to consider major sources of dust and sensitive receptors. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

14.9 Noise

14.9.1 Potential Impacts

During construction, localised increases in noise will be caused by blasting, vehicles on access roads, and general construction activities on site. Vibration would be felt close to construction equipment.

Noise that emanates from construction and operational activities will be addressed through targeted best practices for noise monitoring and management in the EMPr. The associated regulated standards need to be adhered to.

Project personnel working on the construction site will experience the greatest potential exposure to the highest levels of noise and vibration. Workplace noise and vibration issues will be managed as part of the Occupational Health and Safety Management System to be employed on site, which will include specific measures aimed at preventing hearing loss and other deleterious health impacts.

14.9.2 Impact Assessment

Noise	
Project Life-cycle:	Construction
Potential Impact:	Excessive noise levels as a result of construction activities
Proposed Mitigation:	<ul style="list-style-type: none"> • The provisions of SABS 1200A will apply to all areas within audible distance of residents. • Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners/occupiers and community members. • Construction activities generating output levels of 85 dB or more will be confined to normal working hours. • Noise preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to be employed.

Noise							
	<ul style="list-style-type: none"> Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. Noise to be monitored (baseline and during construction). Sampling locations to consider major noise sources and sensitive receptors. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

14.10 Access Roads

14.10.1 Potential Impacts

The Brandkop Mixed-Use Development requires underwent a Traffic Impact Analysis (**Appendix L**). The study addressed relevant transport and traffic-related aspects that could be affected by the proposed Brandkop Development. However, the report provides a schematic analysis for the development, a detail analysis of the impact is still to follow. This draft report is based on the site visits and data collected on site. The following were noted:

- The proposed development is well served by existing local road network, including N1, Jagersfontein Road and Pellessier Drive;
- The development is planned to be Transit Orientated Development, which will minimise the number of private car trips;
- The development is accessed from high-order roads. Access management principle will be applied to the proposed development;
- Safety issues i.e pedestrian sidewalks are to be considered in the proposed development especially along the institutional and business area; and
- There is a proposed link that will connect the development to the proposed Mangaung Zoo. The aligned of this road will have an impact to on the proposed development. MMM will have be consulted to confirm the status the plans.

14.10.2 Impact Assessment

Access Roads	
Project Life-cycle:	Construction
Potential Impact:	<ul style="list-style-type: none"> Inadequate road conditions; Disruptions to existing road users; Safety risks; and Increase in dust levels.
Proposed Mitigation:	<ul style="list-style-type: none"> Make provision for community members to access their homesteads.

Access Roads							
	<ul style="list-style-type: none"> Speed limit of 40km/h on public and other roads within the project area to be adhered to. Access roads to be maintained in a suitable condition. Suitable erosion protective measures to be implemented for access roads during the construction phase. Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented. Clearly demarcate all access roads. Clearly mark pedestrian-safe access routes. Ensure that service nodes such as schools, clinics, places of worship, etc. remain easily and safely accessible at all times. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Almost Certain	3	-42
With Mitigation	-	Local	Low	Short	Moderate	1	-5

14.11 Waste Management

14.11.1 Potential Impacts

Waste management aims to avoid waste pollution of both land and water resources during and as a consequence of construction of the Brandkop Mixed-Use Development. The following describes the impacts during the construction phase:

- Waste generated from site preparations;
- Domestic waste;
- Surplus and used building material;
- Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags);
- Wastewater (sanitation facilities, washing of plant, operations at the batching plant, etc.); and
- Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks.

14.11.2 Impact Assessment

Waste Management	
Project Life-cycle:	Construction
Potential Impact:	<ul style="list-style-type: none"> Use of veld/ surface water areas for ablation purposes Land, air and water pollution through poor waste management practises
Proposed Mitigation:	<ul style="list-style-type: none"> No ablation facilities to be positioned within riparian area. Sufficient ablation facilities to be provided at the Construction Camp and along construction servitude. Suitable litter receptacles to be positioned strategically across the site at all working areas. Waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes).

Waste Management							
	<ul style="list-style-type: none"> The Contractor shall dispose of all refuse generated on site or from the activities of construction or its related activities. The contractor shall on a weekly basis dispose of all refuse at an approved refuse disposal site. Proof of disposal must be kept on record. Littering by the workers is prohibited. Clearly marked litterbins must be provided on site. Monitor the presence of litter on site. All staff shall be sensitised to this effect. The entire site will be cleared of construction material, metal, tins, glass bottles, and food packaging or any other type of empty container or waste material or waste equipment used by the construction team on a daily basis. Waste material that may harm man or animals should be removed immediately. No hazardous materials, e.g. oil, diesel and fuel should be disposed of in the veldt. Any diesel, oil or petrol spillages are to be collected and stored in specially marked containers and disposed of at a permitted waste disposal site and must be treated as hazardous waste. No refuse or litter is allowed to be burnt on site. The recycling of all waste is to be encouraged of both the contractor and staff. All vehicle parking areas and vehicle servicing areas are to be inspected carefully for diesel, oil and other spillages weekly. Excess spoil material should remain in the inundated area. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Likely	3	-36
With Mitigation	-	Local	Medium	Short	Unlikely	1	-8

14.12 Visual Aesthetics

14.12.1 Potential Impacts

A substantial area will be cleared within the construction domain to build the physical infrastructure of the development.

The sense of place will be adversely affected through the various activities associated with the construction phase as well as the permanent project components during the operational phase. The attractive “koppie” and mountainous scenery will also be lost.

The findings from the Visual Impact Assessment (Axis Landscape Architecture, 2015) follow.

14.12.1.1 Landscape Impacts

The landscape impact severity refers to the magnitude of impact resulting from the proposed project components. The severity of landscape impact is examined by discussing the following factors:

- Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as vegetative screening, diversity of colours and patterns and topographic variability. It

also relates to the type of project in terms of its vertical and horizontal scale, colours and patterns; and

- Visual contrast is the degree to which the aesthetic characteristics (line, form, colour and texture) of the proposed project differ from that of the existing landscape.

Loss of grassveld during construction

The proposed development requires the removal of grassveld in order to accommodate the development. Due to the sloping topography, vegetation and existing land-use the area has a low VAC. The removal of parts of the grassveld during the construction stage as well as the low VAC of the area will result in a moderate landscape impact.

Alteration to existing tributaries and dam

The existing tributaries and dam are currently in a neglected state. Earthworks will be necessary to achieve the desired result. During construction, the earthworks will expose soil that will visually contrast in colour with the vegetated areas surrounding it. The water diversion structures and earthworks equipment will temporarily detract from the existing character. Due to the low VAC of the area the temporary character change will only be experienced on a local level. After construction the disturbed areas will be rehabilitated to a better than original condition. The impact will be positive, improving the current condition of the watercourse and maintaining a high visual quality through the operational stage

Change in surface cover

The site preparation and construction stage will cause high levels of visual contrast. Portions of the vegetated surface cover will be cleared to make way for the new proposed development. The exposed soil and the presence of construction equipment, material stockpiles, site offices and construction camps will contrast in colour and form with the receiving environment. The low VAC of the receiving environment will expose the construction activity. The construction areas will cause a noticeable character change due to the lower VAC and the greater visual contrast that will be visible between the construction site and the receiving environment. The completed development will introduce alternative land uses to the site that will alter the existing character. The completed development and landscaping of the open spaces around the buildings will be an improvement from the construction phase. During the operational phase the landscape and buildings will be maintained to a high visual quality. On a regional scale, the development can be interpreted as a new development, expanding the residential land use into the open space. The development will be compatible with the adjacent residential and agricultural character in that it will have a different density and scale due to the larger loose standing buildings.

14.12.1.2 Visual Impacts

Severity of visual impact refers to the magnitude of change to specific visual receptor's views. Severity of visual impact is influenced by the following factors:

- The viewer's exposure to the development;
 - Distance of observers from the proposed development;
 - The visibility of the proposed development;
 - Number of affected viewers; and
 - Duration of views to development experienced affected viewers
- Degree of visual intrusion created by the development.

Empirical research has indicated that the visibility of an element in the landscape and hence its severity of visual impact, decreases as the distance between the observer and the element increases. This is due to the fact that the further one stands from an element in the landscape, the less area it occupies in one's visual field and the less significant the element becomes in relation to the rest of the viewed landscape. The landscape and all its comprising components start to dominate this one element and the severity of visual impacts becomes negligible.

Residents

The residents of Pelisier, Lourier Park, Bloemdal and Quaggafontein will be affected by the construction of the new development due to their proximity to the site. This is especially applicable to the residents in the first rows of houses facing the site. The visibility of the construction activity will be high especially when construction occurs near the boundary of the site, which is closest to the affected receptors. The active operation of construction equipment may generate dust clouds and noise that will increase resident's awareness of the operation. The construction activity will cause unsightly views as the soils are exposed and the disorganised arrangement of stockpiles, site offices and construction equipment dominate the scene.

Visual intrusion will decrease as the project nears completion and the site is cleared of construction elements. The completed buildings, landscaped gardens and wellmaintained golf course will be an improvement on the active construction site and have a higher visual quality and appeal. The maturing of new trees will in time partially or completely screen the new buildings, reducing visibility of the development. The residents within a 2 km radius will experience a moderate viewer exposure of the construction activity due to their close proximity and the low number of viewers in the affected area. The residents will be exposed to the construction activity for the complete duration of the phase thus aggravating the severity of impact.

Residents outside the 2 km radius zone will not experience the full extent of the development and may only be exposed to fragmented views of the construction phase and completed development due to the topography that screens most of the site. The visual intrusion is considered to be minimal and the distance between the observers and the proposed development is in itself a mitigating factor. The severity of visual impact for both stages of the development will be low.

Recreational Users and Tourists

Tourists travelling on the R706 will experience views of the site and the construction activity. The visual intrusion, caused by the exposed soil and the construction operation will be high due to the relatively large part of the site that is visible from the R706. The visual exposure will be relatively moderate considering the number of tourists travelling these roads. Their duration of views of the construction activities will be short, only lasting for a few minutes. The severity of visual impact during the construction stage is expected to be moderate, decreasing to low severity once the development is complete and the disturbed areas are occupied by completed buildings and landscaped gardens.

Motorists

Due to the speed motorists' travel at, their views of the site and the associated construction activity will be momentary, thus limiting the duration of exposure to unsightly views. During construction, traffic delays may occur due to construction on the road verges or heavy vehicle circulation on the roads. The traffic delays increase motorist's awareness and increase the duration of their exposure to views of the construction activity. The severity of visual impact will be moderate during the construction stage and will decrease to low severity once the development is completed.

14.12.2 Impact Assessment

Visual Aesthetics							
Project Life-cycle:	Construction and Operation						
Potential Impact:	<ul style="list-style-type: none"> Reduction in visual quality due to construction activities. Visual impacts associated with the operation of the development. 						
Proposed Mitigation:	<ul style="list-style-type: none"> On-going housekeeping to maintain a tidy construction area. The site will be shielded / screened to minimise the visual impact, where practicable. Where practicable, development designs to compliment the natural surroundings in order to preserve a sense of place. In general, no slopes steeper than 1(V):3(H) are permitted in cut-and-fill areas, unless otherwise specified by the Project Manager. Steeper slopes require protection. New slopes must mimic the natural slopes and topography, where possible. After the construction phase, the areas disturbed that are not earmarked for operational purposes must be rehabilitated by appropriate landscaping, levelling, topsoil dressing, land preparation, alien plant eradication and vegetation establishment. Monitor the re-growth of invasive vegetative material. Manage encroachment of exotic vegetation, as necessary. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Almost Certain	2	-28
With Mitigation	-	Local	Medium	Short	Likely	1	-12

The impacts assessment for the visual quality and associated attributes is supplemented by the following evaluation conducted as part of the Visual Impact Assessment (Axis Landscape Architecture, 2015).

LANDSCAPE IMPACT – LOSS OF GRASSVELD DURING CONSTRUCTION							
Activity	Nature of Impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance	
						WOM	WM*
Removal of grassveld during construction phase.	Negative – Removing landscape elements that are fundamental in establishing a valued landscape character	Regional	Permanent	Low	Highly probable	Moderate	Low

LANDSCAPE IMPACT – ALTERATION TO EXISTING TRIBUTARIES AND DAMS							
Activity	Nature of Impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance	
						WOM	WM*
Alteration to existing tributaries and dam – construction phase	Negative – Removing and altering landscape elements that contribute to the local character of the area.	Local	Temporary	Moderate	Definite	Moderate	Low
Upgrading and maintaining the tributaries to a high standard – operational phase	Positive – Re-configuration and maintaining a high quality landscape feature with visual appeal	Local	Permanent	Moderate	Definite	Low	N/A

LANDSCAPE IMPACT – CHANGE IN SURFACE COVER							
Activity	Nature of Impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance	
						WOM	WM*
Completed development in 5 years time	Negative – Adding additional land uses that alter the grassveld character of the site and cause a loss of open space.	Regional	Permanent	Moderate	Definite	Moderate	Low

VISUAL IMPACT – RESIDENTS							
Activity	Nature of Impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance	
						WOM	WM*
Residents of Pelisier, Lourier Park, Bloemdal and Quaggafontein							
Construction of development	Negative – Altering the visual character of the site due to the presence of unsightly views of the construction activity.	Local	Temporary	Moderate	Definite	Moderate	Low
Completed development in 5 years time	Negative – Altering the visual character of the site due to the introduction of new land uses on the site.	Local	Permanent	Moderate	Definite	Moderate	Low
Residents outside a 2 km radius from the site							
Construction of development	Negative – Altering the visual character of the site due to the presence of unsightly views of the construction activity.	Regional	Permanent	Low	Probable	Low	N/A
Completed development in 5 years time	Negative – Altering the visual character of the site due to the introduction of new land uses on the site.	Regional	Permanent	Low	Probable	Low	N/A

VISUAL IMPACT – RECREATIONAL USERS AND TOURISTS							
Activity	Nature of Impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance	
						WOM	WM*
Construction of the estate and alteration of the watercourse	Negative – Causing unsightly views of exposed soil and construction activity.	Local	Temporary	Moderate	Definite	Moderate	Low
Completed development in 5 years time	Negative – Altering the existing grassveld appearance	Local	Permanent	Low	Definite	Low	Low

VISUAL IMPACT – MOTORISTS							
Activity	Nature of Impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance	
						WOM	WM*
Construction of development	Negative – Causing unsightly views of exposed soil and construction activity	Local	Temporary	Moderate	Definite	Low	N/A
Completed development in 5 years time	Negative – Altering the existing grassveld appearance	Local	Permanent	Low	Definite	Low	N/A

14.13 Socio-Economic Environment

14.13.1 Potential Impacts

The proposed development will result in a number of positive socio-economic impacts including providing employment to the local community and indirectly improving services in the area through service provision to the development.

One potential negative impact during construction is the potential increase of crime in the area (often occurring due to the influx of temporary construction workers). There will also be a huge impact to the farmers that currently vacate the site as they need to be relocated by MMM.

14.13.2 Impact Assessment

Socio-Economic Environment	
Project Life-cycle:	Construction and Operation
Potential Impact:	Job Creation
Proposed Mitigation:	<ul style="list-style-type: none"> Use local labour as far as possible. Where possible use labour-intensive methods of construction. Create opportunities for the employment of women. Where feasible introduce a programme to transfer skills particularly during the construction phase of the project. Local skilled labour should be sourced where possible. The local and district

	<p>municipalities should be approached to assist in this regard.</p> <ul style="list-style-type: none"> Once the site is occupied, businesses and industry should employ local people (operational). 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	+	Local	Low	Short	Likely	1	6
With Mitigation	+	Regional	High	Permanent	Likely	3	90

Socio-Economic Environment							
Project Life-cycle:	Construction						
Potential Impact:	Increased Crime						
Proposed Mitigation:	<ul style="list-style-type: none"> The construction site should be fully fenced to ensure that workers have one access point in and out of the site. Establish employment strategy. Ensure adequate security around the site footprint. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Unlikely	2	-16
With Mitigation	-	Local	Low	Short	Rare	1	-3

Socio-Economic Environment							
Project Life-cycle:	Construction						
Potential Impact:	Safety and Security						
Proposed Mitigation:	<ul style="list-style-type: none"> Erect signage and fences to deter theft. Access to site must be strictly controlled with closed off access points. Signage must be made use of to alert people to potential dangers. EMPr must have a safety plan to ensure the protection of humans and livestock. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Almost Certain	3	-42
With Mitigation	-	Local	Low	Short	Almost Certain	2	-14

Socio-Economic Environment							
Project Life-cycle:	Pre-construction						
Potential Impact:	Relocation of farmers on site						
Proposed Mitigation:	<ul style="list-style-type: none"> MMM to develop a Relocation Plan. 						
	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	High	Permanent	Almost Certain	3	-81

Socio-Economic Environment							
With Mitigation	-	Local	Low	Permanent	Almost Certain	2	-18

14.14 No-Go Impacts

The impacts associated with the possibility of the development not proceeding include huge social impacts. The lack of housing and business opportunities that would be lost in the Bloemfontein area are very costly economically. In addition, there will be a number of socio-economic opportunities which are lost including the loss of the potential employment benefits in the local community as well as a loss of the injection of funds into the area through construction.

In contrast, should the proposed development not go ahead, any potentially significant environmental issues associated with the project (refer to Section 14) would be irrelevant and the status quo of the local receiving environment would not be affected by the project-related activities. The objectives of the project and the economic benefits discussed above would however not materialise.

14.15 Cumulative Impacts

According to GN No. R. 543 (18 June 2010), a “cumulative impact”, 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.

Cumulative impacts can be identified by combining the potential environmental implications of the proposed development of Brandkop Mixed-Use Development with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

The potential cumulative impacts associated with the project include the following:

- The construction period will be associated with traffic-related impacts to the local road network. If it is deemed necessary to obtain construction material from a commercial source, the cumulative impacts to the roads that are to be affected would need to be considered and a detailed Traffic Impact Assessment would need to be implemented. Another large-scale development is planned adjacent to the site, and thus the transportation networks need to be assessed.
- The Terrestrial Ecological Study identified species of conservation importance that could be adversely affected by the project activities. These studies took into consideration the existing local impacts to the biodiversity and the incremental loss of

conservation-worthy species of the project within the context of the provincial conservation goals and targets.

- Through the Search, Rescue and Relocation Plan a concerted effort will be made to prevent the loss of Red Data, protected and endangered fauna and flora species that will be affected by the project. With the relocation of these species to suitable habitat the cumulative impact to biodiversity could be adequately managed.
- Exotic vegetation is encountered in the project area and is mostly associated with historical disturbances such as grazing. Large areas will be cleared during the construction phase of the project and all disturbed areas will need to be appropriately rehabilitated to ensure that a cumulative impact is not caused in this regard.
- The soils in some parts of the project area are erodible. Any previous disturbance (including grazing) will be aggravated by the construction activities if this impact is not properly managed.

15 ANALYSIS OF ALTERNATIVES

Alternatives are the different ways in which the project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project. By conducting the comparative analysis, the BPEOs can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that “provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term”.

15.1 “No-Go” Option

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the project is included in the evaluation of the alternatives. The implications of the ‘no go’ option are discussed in Section 14.18. The ‘no go’ alternative is not supported due to the following reasons:

- Mangaung has a huge housing backlog compared with other municipalities in the Free State. More than half of the population resides in Bloemfontein and in particular, in the Mangaung Township area because Bloemfontein is perceived as an economic hub of the City and people believe that there are better work prospects and better living conditions in this region. Housing and business opportunities are thus needed.
- The location of new housing projects is mainly driven by the SDF, which makes provision for both public and private initiated developments within the urban edge. Apart from the Informal ISUS that deals with informal settlements only, several priority locations have been identified for future development within Mangaung. This includes portion 5 of the Brandkop Farm No. 702 in Bloemfontein.
- Therefore there is a need for housing developments within the Bloemfontein area and the proposed Brandkop Mixed-Use Development will cater for these needs. The residential units will consist of multi-storey walk up units, gap housing and conventional housing. Provision will also be made for business (convenience retail and commercial) facilities. Transport facilities such as buses and taxi’s will be provided for to connect the development to the Lourier Park and Pellissier areas and therefore to the greater Bloemfontein area. Public open spaces (including conservation areas) will enhance the sense of place and living environment.

In contrast, should the proposed development not go ahead, any potentially significant environmental issues associated with the project (refer to Section 14) would be irrelevant and the status quo of the local receiving environment would not be affected by the project-related activities. The objectives of the project and the economic benefits discussed above would however not materialise. The ultimate economic benefits of the project are in favour of the project being implemented based on the prime objectives of socio-economic upliftment.

15.2 Specialist Studies

Table 30 summarises the findings of the various relevant specialists in terms of their respective preferences for the project alternatives. It can be seen that majority of the Specialists had no preference with regards to the two layout options except for the VIA.

Table 30: Summary of Specialists' Preferred Options

Alternative Layout	Specialist Study Preference					
	Terrestrial Ecological	Aquatic and Wetland	Visual	Agricultural	Heritage	Palaeontological
1	-	-	✓	-	-	-
2	-	-		-	-	-

No fatal flaw was identified by any specialist.

15.3 Technical Preference

In terms of town planning and engineering preference, Alternative 1 is preferred. A comparison of the project options by the technical team is provided in **Table 31**.

Table 31: Summary of Technical Team Preferred Options

Alternative Layout	Technical Preference		
	Advantages	Disadvantages	Preference
1	<ul style="list-style-type: none"> • Larger open space areas. • Ridge area has been made accessible for pedestrian/trails. • Drop off zones have been provided for at the School (Educational) properties. 	<ul style="list-style-type: none"> • None 	✓

Alternative Layout	Technical Preference		
	Advantages	Disadvantages	Preference
	<ul style="list-style-type: none"> Stormwater issues have been resolved by removing almost all cul-de-sac's and re-aligning the remaining cul-de-sac's. 		
2	<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> Major bypass road not included in this layout. Un-functional small open spaces was provided in this layout. 16m Building line was provided on this layout (Provincial Roads required a 50m building line). No access was provided on this layout to the open areas (ridge areas). No Municipal properties were provided for in this layout. No Drop off zones were provided for in this layout for schools. This layout resulted in stromwater issues at certain cul-de-sac's. 	

15.4 Comparative Impacts of Alternatives

The majority of the Specialist Studies had no alternative layout preference, yet the technical team have a strong preference for Alternative layout 1.

Thus in terms of the biophysical and cultural environment, there was no preference in alternatives. With regards to economic and technical environment, Alternative 1 is preferred.

15.5 BPEO Selection

Based on the recommendations of the specialists, technical considerations and the comparison of the impacts, the following layout option was identified as the BPEO for the Brandkop Mixed-Use Development:

- Alternative 1

A layout diagram of the selected development is included in **Figure 36**.

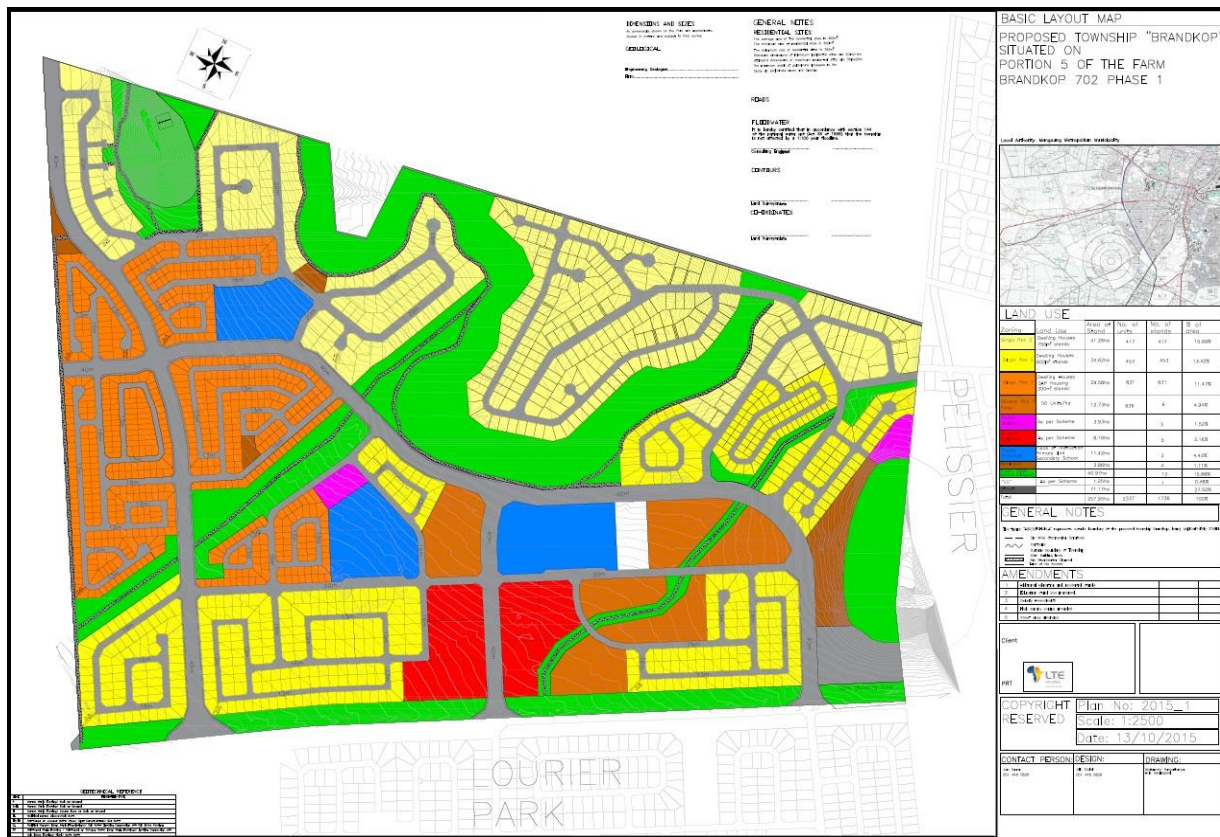


Figure 36: Layout Diagram for BPEO for Brandkop Development

16 PUBLIC PARTICIPATION

The purpose of the public participation process for the proposed development includes:

- Providing IAPs with an opportunity to obtain information about the project;
- Allowing IAPs to express their views, issues and concerns with regard to the project;
- Granting IAPs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the project; and
- Enabling the project team to incorporate the needs, concerns and recommendations of IAPs into the project, where feasible.

The public participation process that was followed for the proposed project is governed by NEMA and GN No. R. 982. **Figure 10** outlines the key milestones in the public participation process undertaken for the Scoping (completed) and EIA phases for the proposed Brandkop Mixed-use Development.

The approved Plan of Study for the EIA stipulates the activities to be undertaken as part of the public participation for the project, in accordance with regulatory requirements, which

forms the basis of the discussion to follow. Note that the public participation conducted for the Scoping phase will not receive attention in this section as it was comprehensively discussed in the Scoping Report. Emphases will thus primarily be placed on the EIA public participation process.

16.1 Public Participation during the Scoping Phase

The primary tasks undertaken as part of public participation during the Scoping phase included the following (details provided in Scoping Report):

- Compiling a database of IAPs;
- Notifying the affected landowners of the project;
- Announcing the project, which included distributing Background Information Documents (BIDs) and Reply Forms, placing onsite notices, and placing newspaper adverts;
- Convening public meetings and authorities meetings to announce the project and to present the Draft Scoping Report;
- Granting IAPs and authorities an opportunity to review the Draft Scoping Report; and
- Compiling and maintaining a Comments and Responses Report.

16.2 Public Participation during the EIA Phase

16.2.1 Maintenance of the IAP Database

A database of IAPs (refer to **Appendix H**), which includes authorities, different spheres of government (national, provincial and local), parastatals, stakeholders, landowners, interest groups and members of the general public, was maintained during the EIA phase.

16.2.2 Notification – Approval of Scoping Report and Notification of Public Review of Draft EIA Report

Registered IAPs were notified of the approval of the Final Scoping Report and the public review of the Draft EIA Report at the same time. Registered IAPs were notified of the approval and review period by emails or SMS. These notices also included information on the public meeting for the EIA Phase.

16.2.3 Public Review Period of Draft EIA Report

In accordance with G.N. No. R. 982 of 04 December 2014, IAPs are granted an opportunity to review and comment on the Draft EIA Report. Hard copies and of the document will be placed at the venues listed below (**Table 32**). An electronic copy of the report will also be available on Dropbox. Emails or SMSes will be sent to all registered IAPs which will include

the details of the review period of the Draft EIA Report. Proof of the notification of the public review period will be included in the Final EIA Report.

Table 32: Locations of Draft EIA Report for Review

Venue	Address	Contact Details
Fichardt Park Library	Benade Drive, Fichardt Park, Bloemfontein	(051) 522 8884/5
Lourier Park Library	Cnr Doringklaat & Nanabessie Street, Lourier Park, Bloemfontein	(051) 411 1005
Mangaung Public Library	Moshoeshoe Street, Rocklands, Bloemfontein	(051) 410 8273

The public review of the Draft EIA Report will occur for a 30-Day review period **from 26 May 2016 to 27 June 2016**. Refer to proof of notification in **Appendix I**.

For any remarks on the Draft EIA Report, the reviewer can complete a Comment Sheet, which will be attached to the hardcopies of the Draft EIA Report. These completed Comment Sheets need to be forwarded to Nema Consulting by 10 June 2016. Comments received from IAPs from the review of the Draft EIA Report will be contained in a Comments and Responses Report in the Final EIA Report, which will be submitted to Free State DESTEA.

16.2.4 Authority Review Period of Draft EIA Report

Hard copies of the document were also provided to the following key regulatory and commenting authorities:

- DESTEA;
- Free State Regional DWS;
- Free State Regional DAFF;
- Free State DMR;
- SAHRA;
- FSHRA;
- MMM, including:
 - Roads and Stormwater Department;
 - Human Settlements Department;
 - Environmental Management Department; and
 - Ward Councillor for Ward No. 26 and adjacent Ward Councillor for Ward No.25.

An electronic copy of the report will also be available on Dropbox. Emails or SMSes will be sent to all commenting authorities which will include the details of the review period of the Draft EIA Report. Proof of the notification of the authority review period will be included in the Final EIA Report.

The authority review of the Draft EIA Report will take place from **26 May 2016 to 05 July 2016** (40-Day review). Refer to proof of notification in **Appendix I**.

16.2.5 Meetings

16.2.5.1 Public Meeting

A public meeting to present the Draft EIA Report and to provide IAPs with a platform for project related discussions will be held. The details of the public meeting are provided in **Table 41**.

Table 33: EIA Public Meeting

Date	Time	Venue
30 June 2016	18h00 - 20h00	President Brand Primary School (Wag-'n-Bietjieboslaan, Bloemfontein)

16.2.5.2 Authority Meeting

An Authority Meeting will be held to present the Draft EIA. Date to be confirmed.

16.2.6 Comments and Responses

The EIA Comments and Responses Report (**Appendix K**) summarises the correspondence received by IAPs and Organs of State completed via the Reply Forms, Comments Sheets, letters, faxes and emails. This report also includes a summary of the discussions from Focus Group Meetings and Stakeholder Meetings held to date, during the Public Participation phase. This report captures all the significant issues and queries raised, any statements that were made, and a record of all IAPs that registered. This report also attempts to address every comment through responses and input provided by the project team.

All comments received following the public review of the Draft EIA Report will be included in the Final EIA Report Comments and Response Report.

16.2.7 Review of the Final EIA Report

Registered IAPs and authorities will be granted an opportunity to review and comment on the Final EIA Report. A link on Dropbox containing the electronic Final EIA Report will be sent to authorities and registered IAPs only. Any further comments from registered IAPs will be forwarded to the Competent Authority.

16.2.8 Notification of Free State DESTEA Decision

All authorities and registered IAPs will be notified via email or SMS after having received written notice from DESTEA on the final decision for the project. Advertisements will also be placed as notification of the Department's decision. These notifications will include the appeal procedure to the decision and key reasons for the decision. A copy of the decision will also be provided to IAPs on request.

17 EIA CONCLUSIONS AND RECOMMENDATIONS

17.1 Sensitive Environmental Features

Within the context of the project area, cognisance must be taken of the following sensitive environmental features (shown in in **Figure 37**) for which mitigation measures are included in the EIA Report and EMPr:

- All existing infrastructure and structures belonging to the Brandkop Livestock Farmers must be relocated before construction by means of a Relocation Plan by MMM.
- The Vulnerable Bloemfontein Dry Grassland Threatened Terrestrial Ecosystem and fauna and flora species of conservation concern occur in the area, which need to be protected against the project's potential adverse impacts. Sensitive species to be identified as part of the pre-construction survey. If relocation is not required, then these species need to be adequately protected from construction activities. One Orange-Listed Data plant species was recorded on site, namely *Boophane disticha* (Century plant). This species is listed as Declining and so, prior to construction, it must be removed and replanted during rehabilitation process.
- All traffic and pedestrians on the public roads are regarded as sensitive and measures need to be implemented to safeguard these road users.
- Existing communication channels need to be duly respected and adhered to when engaging with the community.
- Livestock and unauthorised access to the construction domain needs to be prevented. Excavations to be adequately safeguarded.

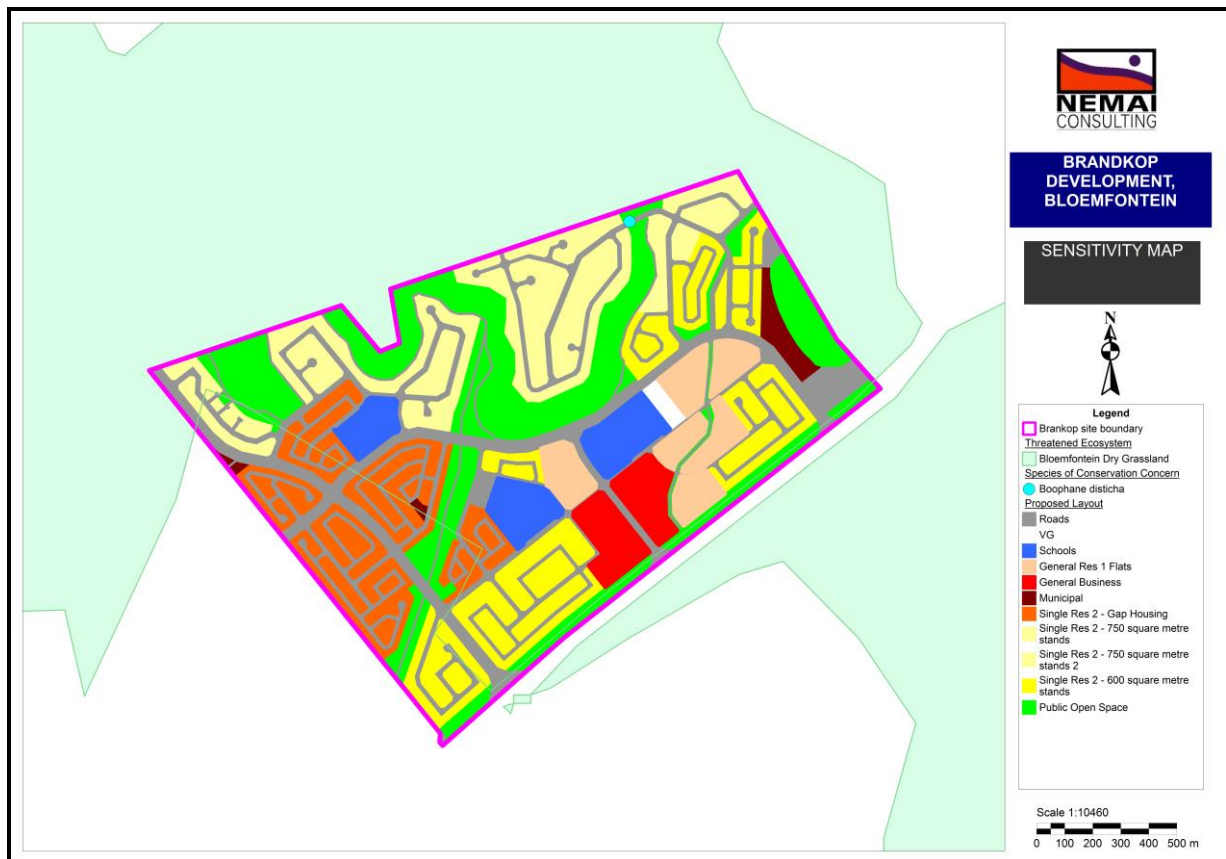


Figure 37: Sensitivity Map for Brandkop Mixed-use Development

The sensitivity map shown in **Figure 37** needs to be made available to the implementation team (including the Project Manager, Environmental Control Officer and Contractor) in GIS format to allow for further consideration and adequate interpretation at an appropriate scale.

17.2 Environmental Impact Statement

Mangaung covers 6 863 km² of land and comprises three prominent urban centres, which are largely surrounded by rural areas (MMM IDP, 2013-2014). The Bloemfontein area contains more than half of the population (52%) with the Free State. The Mangaung population is growing at a fast pace; according to statistics South Africa (Stats SA) in 2011, there were 747 431 people residing in the jurisdiction of Mangaung. In line with the population growth, there has been an increase in the number of households in Mangaung. In 2001 there were 185 013 households in Mangaung; however, in 2011 they have increased to 231 921. The average household size in 2001 was 3.4% and in 2011 the size has decreased to 3.2%. Mangaung has a huge housing backlog compared with other municipalities in the Free State. More than half of the population resides in Bloemfontein and in particular, in the Mangaung Township area because Bloemfontein is perceived as an economic hub of the City and people believe that there are better work prospects and better

living conditions in this region. Mangaung has experienced an increase in the provision of formal housing; while there has been a decrease in the informal dwellings. Part of this decrease could be attributed to more formal houses being provided through some of the government housing programmes.

An internal investigation by the Municipality during 2010 revealed that the current housing backlog stands at approximately 53,820 houses in Mangaung, the bulk of which are residing in the Mangaung Township. This figure has increased to 58 820 during 2011, with the demand mainly found in the affordable (Gap) housing and the rental markets. The City has not been supplying affordable rental housing over a number of years thus compromising on the opportunity to improve spatial integration, urban efficiency, as well as on opening up economic potential in those planned areas where bulk infrastructure, such as sanitation, water and transport may be under-utilised.

The location of new housing projects is mainly driven by the SDF, which makes provision for both public and private initiated developments within the urban edge. Apart from the ISUS that deals with informal settlements only, several priority locations have been identified for future development within Mangaung. This includes portion 5 of the Brandkop Farm No. 702 in Bloemfontein. In 2013, the MMM adopted an IHSP, which main aim was to bring about more integrated development with a combination of mixed housing typologies.

Therefore there is a need for housing developments within the Bloemfontein area and the proposed Brandkop Mixed-Use Development will cater for these needs. The residential units will consist of multi-storey walk up units, gap housing and conventional housing. The Gap housing will cater for people who earn too much to qualify for state assistance (RDP housing), yet earn too little to qualify for home loans in the private property market. Conventional housing provides quality, safe, affordable housing for low and moderate-income families. The Brandkop Mixed-Use Development will also include institutional and educational facilities such as schools and community centres. Provision will also be made for business (convenience retail and commercial) facilities. Transport facilities such as buses and taxi's will be provided for to connect the development to the Lourier Park and Pellissier areas and therefore to the greater Bloemfontein area. Public open spaces (including conservation areas) will enhance the sense of place and living environment.

Critical environmental activities that need to be executed during the project life-cycle include the following:

- Pre-construction Phase
 - Diligent compliance monitoring of the EMP, environmental authorisation and other relevant environmental legislation;
 - Undertake a walk through survey of the project footprint by the relevant environmental specialists to identify sensitive environmental features;

- Develop Search, Rescue and Relocation Management Plan, based on findings of walk through survey;
- Search, rescue and relocation of Red Data, protected and endangered species, medicinal plants, heritage resources and graves (based on area of influence of the construction activities);
- Relocation plan by MMM for Brandkop Livestock farmers;
- Develop environmental monitoring programme (air quality, water quality, noise, traffic, social);
- Conduct further baseline environmental studies for environmental monitoring programme;
- Barricading of sensitive environmental features (e.g. ridges);
- Permits if protected trees are to be cut, disturbed, damaged, destroyed or removed;
- Permits if heritage resources are to be impacted on and for the relocation of graves;
- Establish EMC;
- On-going consultation with IAPs; and
- Other activities as per EMPr;
- Construction Phase
 - Diligent compliance monitoring of the EMPr, environmental authorisation and other relevant environmental legislation;
 - Ongoing search, rescue and relocation of Red Data, protected and endangered species, medicinal plants, heritage resources – permits to be in place;
 - Implement environmental monitoring programme (air quality, water quality, noise, traffic, social);
 - Develop Rehabilitation Management Plan for approval by DESTEA;
 - Reinstatement and rehabilitation of construction domain (outside of inundation areas, as necessary);
 - Convene EMC Meetings;
 - On-going consultation with IAPs; and
 - Other activities as per EMPr;
- Operational Phase
 - Management of mixed-use development; and
 - On-going consultation with IAPs.

Based on the recommendations of the specialists, technical considerations and the comparison of the impacts, the following layout was identified as the BPEO for the related project components:

- Layout Alternative 1

With the selection of the BPEO, the adoption of the mitigation measures include in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

17.3 Recommendations

The following key recommendations, which may also influence the conditions of the Environmental Authorisation (where relevant), accompany the EIA for the development of the Brandkop Mixed-Use Development:

1. Where relevant, the construction domain needs to be restricted as much as possible to avoid disturbance outside of the site footprint. All external areas that are not associated with permanent infrastructure need to be adequately rehabilitated.
2. It is recommended that the following EMPrs be developed as further information becomes available during the implementation of the project:
 - a. Search, Rescue and Relocation Management Plan for Red Data, protected and endangered species, medicinal plants, heritage resources and graves;
 - b. Relocation Plan for Brandkop Livestock farmers;
 - c. Rehabilitation Management Plan for disturbed areas; and
 - d. Operational EMPr.
3. As discussed in the EMPr, various forms of monitoring are required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project. The types of monitoring to be undertaken include:
 - a. Baseline Monitoring needs to be undertaken to determine to the pre-construction state of the receiving environment, and serves as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects;
 - b. Environmental Monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded; and
 - c. Compliance Monitoring and Auditing for the independent Environmental Control Officer (ECO) to monitor and audit compliance against the EMPr and Environmental Authorisation.

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4. Pertinent recommendations from the Terrestrial Ecological Impact Assessment (Nemai Consulting, 2015) include:
 - a. One Orange-Listed Data plant species was recorded on site, namely *Boophane disticha* (Century plant). This species is listed as Declining and so, prior to construction, it must be rescued and relocated to a conservation area or facility such as a nursery near the site suitable for the survival of this species. Given that the Red Data plant species was observed, it is important that a qualified professional should be on site prior to construction to identify other species of conservation importance which may occur on site.
 - b. Newly cleared soils will have to be re-vegetated and stabilised as soon as construction has been completed and there should be an on-going monitoring program to control and/or eradicate newly emerging invasives.
 - c. Due to the presence of termite mounds on site, the probability of finding the Rare Striped Harlequin Snake are higher. During construction, special attention should be paid to the presence on this species on site and should it be found, it has to be rescued on site to suitable areas.
 5. Pertinent recommendations from the Wetland and Aquatic Impact Assessment (SDP, 2015) include:
 - a. No definitive mitigation measures are anticipated. The systems of berms, buffers and impoundments could be incorporated into the landscaping scheme from an aesthetic perspective or incorporated into the stormwater disposal system.
 - b. The system of artificial berms, furrows and impoundments could be useful for controlling stormwater or supplementing any open space system. The discharge of stormwater from site may alternatively, be engineered to evacuate into adjacent stormwater infrastructure which lies to the south of the site. Such stormwater will eventually evacuate into an existing impoundment at Lourierpark, which in turn discharges into agricultural irrigation canals.
 6. Pertinent recommendations from the Visual Impact Assessment (Axis Landscape Architects, 2015) include:
 - a. If practically possible, locate construction camps in areas that are already disturbed or where it isn't necessary to remove established vegetation like for example, naturally bare areas;
 - b. Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance;
 - c. Remove rubble and other building rubbish off site as soon as possible or place it in a container in order to keep the construction site free from additional unsightly elements;

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- d. Rehabilitate or vegetate disturbed areas as soon as practically possible after construction. This should be done to restrict long stages of exposed soil and possible erosion that will result in indirect landscape and visual impacts;
 - e. Dust suppression procedures should be implemented especially on windy days during earth works;
7. During construction, if any heritage resources are found (chance finds) the following protocol must be followed:
- a. All work must stop in the vicinity of the find.
 - b. The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage.
 - c. Free State Provincial Heritage Resources Authority must be informed and a registered heritage specialist must be appointed to undertake an assessment of the find.
 - d. Depending of what is found and the significance thereof, the specialist will advise on the way forward.
 - e. If the resource needs to be removed/altered/destroyed then the necessary permit/s must be obtained from Free State Provincial Heritage Resources Authority.
 - f. Only once the specialist gives the go-ahead can work commence in the area.
 - g. Under no circumstance can heritage material be destroyed or removed from the site.
 - h. Should any remains be found that could potentially be human remains then the SAPS must be contacted.
8. Pertinent recommendations from the Palaeontological Impact Assessment (Paleo Field Services, 2015) include:
- a. During construction, if in situ fossil material is exposed as a result of excavations into fresh sedimentary bedrock, it should be reported to SAHRA and a professional palaeontologist as soon as possible.

18 OATH OF THE EAP AND DECLARATION OF INDEPENDENCE

I (name and surname) Kristy Robertson

At (address) 147 Bram Fischer Drive, Ferndale

ID No. 8910110148089


Hereby make an oath and state that:

In Accordance with Appendix 3 of G.N. R. 982 (04 December 2014), this serves as an affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

Section 3(s)

- i. The correctness of the information provided in this report;
- ii. The inclusion of comments and inputs from stakeholders and interested and affected parties (IAPs);
- iii. The inclusion of inputs and recommendations from the Specialist Reports where relevant; and
- iv. Any information provided by the EAP to IAPs and any responses by the EAP to comments or inputs made by IAPs.

1. I know and understand the contents of this declaration.
2. I do not have any objection in taking the prescribed oath.
3. I consider the prescribed oath to be binding on my conscience.

Signature  Date 23/05/2016

I certify the deponent has acknowledged that he/she knows and understands the contents of the statement and the deponent signature was placed there in my presence.

Commissioner of Oath

Full name

Designation

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