



**Client
Project**

SAROVIC INVESTMENTS CC
TOWNSHIP ESTABLISHMENT ON THE REMAINING EXTENT
OF PORTION 79 OF THE FARM BLESBOKLAAGTE 296 JS &
PORTION 0 (REMAINING EXTENT) OF THE FARM
LEEUVPOORT 283 JS, MPUMALANGA – DRAFT EIAR
EIA Ref No. 1/3/1/16/1N-175
OCTOBER 2019

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OF PORTION 79 OF THE FARM BLESBOKLAAGTE 296 JS &
PORTION 0 (REMAINING EXTENT) OF THE FARM
LEEUEWPOORT 283 JS, MPUMALANGA
DRAFT ENVIRONMENTAL IMPACT
ASSESSMENT REPORT
EIA REF NO. 1/3/1/16/1N-175

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TABLE OF CONTENTS

LIST OF FIGURES	5
LIST OF TABLES	5
APPENDICES	6
REFERENCES	6
DEFINITIONS	8
ABBREVIATIONS	11
1. PROJECT TITLE	12
2. APPLICANT DETAILS	12
3. ENVIRONMENTAL ASSESSMENT PRACTITIONER DETAILS	12
4. LOCATION OF THE DEVELOPMENT FOOTPRINT	12
5. SCOPE OF THE PROPOSED DEVELOPMENT AND ACTIVITIES	16
5.1 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN	16
5.1.1 Roads and Storm Water	19
5.1.2 Water Services	20
5.1.3 Sewerage	21
5.1.4 Electricity	21
5.1.5 Traffic	23
5.2 LISTED ACTIVITIES TRIGGERED BY THE PROPOSED DEVELOPMENT	23
5.3 WATER USE LICENCE ACTIVITIES	28
6. POLICY AND LEGISLATIVE CONTEXT OF THE APPLICATION	29
7. MOTIVATION FOR THE NEED AND DESIRABILITY OF THE PROPOSED DEVELOPMENT	30
7.1 NEED AND DESIRABILITY OF THE DEVELOPMENT IN THE CONTEXT OF THE PREFERRED LOCATION	30
7.2 NEED AND DESIRABILITY IN TERMS OF THE GUIDELINE ON NEED AND DESIRABILITY	31
7.3 NEED AND DESIRABILITY: MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE AS CONTEMPLATED IN THE ACCEPTED SCOPING REPORT	52
8. PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE	52
8.1 ALTERNATIVES CONSIDERED	52
8.1.1 Location	53
Figure 4: Wetland sensitivity map	56
8.1.2 Design/Layout	57
8.1.3 Scale and Magnitude	57
8.1.4 "No-Go Option"	58
8.2 PUBLIC PARTICIPATION PROCESS UNDERTAKEN IN TERMS OF SECTION 41 OF THE EIA REGULATIONS, 2014	58
8.2.1 Public Review of the Draft Scoping Report	59
8.2.2 Summary of the issues raised by the Interested and Affected Parties and how the issues were addressed or incorporated into the Environmental Impact Assessment process	59
8.3 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE ALTERNATIVES CONSIDERED – ENVIRONMENTAL ATTRIBUTES OF THE PROPOSED, PROJECT PROPERTIES (THE PREFERRED ALTERNATIVE)	76
9. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS (PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS THAT THE PROPOSED ACTIVITY AND ASSOCIATED STRUCTURES AND INFRASTRUCTURE WILL IMPOSE ON THE PREFERRED DEVELOPMENT FOOTPRINT)	114

9.1 OBJECTIVES OF THE EIA PROCESS.....	114
9.2 DESCRIPTION OF ALTERNATIVES TO BE CONSIDERED AND ASSESSED WITHIN THE PREFERRED SITE, INCLUDING THE OPTION OF NOT PROCEEDING WITH THE ACTIVITY	115
9.3 DESCRIPTION OF THE ASPECTS THAT HAVE BEEN ASSESSED AS PART OF THE EIA PROCESS.....	115
9.4 ASPECTS ASSESSED BY SPECIALISTS	115
9.5 DESCRIPTION OF THE METHOD OF ASSESSING THE ENVIRONMENTAL ASPECTS AND IMPACTS	117
9.6 ENVIRONMENTAL IMPACTS (ISSUES) AND RISKS IDENTIFIED DURING THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS.....	118
9.7 IMPACT ASSESSMENT [ASSESSMENT OF THE SIGNIFICANCE OF EACH IMPACT (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].....	122
9.8 METHODOLOGY USED IN DETERMINING AND RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS ASSOCIATED WITH THE ALTERNATIVES	149
9.9 POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND ON THE COMMUNITY THAT MAY BE AFFECTED.....	149
9.10 POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND LEVEL OF RESIDUAL RISK	149
9.11 OUTCOME OF THE SITE SELECTION MATRIX	159
9.12 MOTIVATION FOR NOT CONSIDERING ALTERNATIVES (INCLUDING DEVELOPMENT FOOTPRINT ALTERNATIVES).....	159
9.13 CONCLUDING STATEMENT	160
9.14 SUMMARY OF THE FINDINGS AND RECOMMENDATIONS OF SPECIALIST REPORTS COMPLYING WITH APPENDIX 6 OF THE EIA REGULATIONS, 2014, AND AN INDICATION AS TO HOW THESE FINDINGS AND RECOMMENDATIONS HAVE BEEN INCLUDED IN THIS ENVIRONMENTAL IMPACT ASSESSMENT REPORT	161
10. ENVIRONMENTAL IMPACT STATEMENT	171
10.1 SUMMARY OF THE KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT	171
10.2 ENVIRONMENTAL SENSITIVITY OVERLAY MAPS	175
10.3 SUMMARY OF THE POSITIVE AND NEGATIVE IMPACTS AND RISKS OF THE PROPOSED ACTIVITY AND IDENTIFIED ALTERNATIVES	178
10.4 IMPACT MANAGEMENT MEASURES FROM SPECIALIST REPORTS AND THE RECORDING OF THE PROPOSED IMPACT MANAGEMENT OUTCOMES FOR THE DEVELOPMENT, FOR INCLUSION IN THE EMPR	179
10.5 THE FINAL PROPOSED ALTERNATIVES WHICH RESPOND TO THE IMPACT MANAGEMENT MEASURES, AVOIDANCE AND MITIGATION MEASURES IDENTIFIED THROUGH THE ASSESSMENT	179
10.6 ASPECTS WHICH WERE CONDITIONAL TO THE FINDINGS OF THE ASSESSMENT EITHER BY THE EAP OR SPECIALISTS AND WHICH ARE TO BE INCLUDED AS CONDITIONS OF AUTHORISATION	181
10.7 DESCRIPTION OF ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE WHICH RELATE TO THE ASSESSMENT AND MITIGATION MEASURES PROPOSED.....	181
10.8 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	181
10.9 WHERE THE PROPOSED ACTIVITY DOES NOT INCLUDE OPERATIONAL ASPECTS, THE PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED, THE DATE ON WHICH THE ACTIVITY WILL BE CONCLUDED, AND THE POST CONSTRUCTION MONITORING REQUIREMENTS FINALISED	182
11. ENVIRONMENTAL ASSESSMENT PRACTITIONER UNDERTAKING	182
12. DETAILS OF ANY FINANCIAL PROVISION FOR THE REHABILITATION, CLOSURE AND ONGOING POST DECOMMISSIONING MANAGEMENT OF NEGATIVE ENVIRONMENTAL IMPACTS.....	182
13. INDICATION OF ANY DEVIATION FROM THE APPROVED SCOPING REPORT, INCLUDING THE PLAN OF STUDY	182

14. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY	182
15. OTHER MATTERS REQUIRED IN TERMS OF SECTION 24(4)(A) AND (B) OF NEMA	182

LIST OF FIGURES

FIGURE 1: SITE LOCALITY MAP	14
FIGURE 2: ECOLOGICAL SENSITIVITY MAP	54
FIGURE 3: HERITAGE AND PALAEONTOLOGICAL SENSITIVITY MAP	55
FIGURE 4: WETLAND SENSITIVITY MAP	56
FIGURE 5: DETAILED SOIL MAP OF THE PROPOSED DEVELOPMENT AREA	79
FIGURE 6: DETAILED SOIL MAP OF THE STUDY SITE	80
FIGURE 7: LAND CAPABILITY MAP OF THE PROPOSED DEVELOPMENT AREA	81
FIGURE 8: LAND CAPABILITY MAP OF THE SOIL STUDY AREA.....	82
FIGURE 9: PRE-MINING LAND USE MAP OF THE PROPOSED DEVELOPMENT AREA.....	83
FIGURE 10: PRE-MINING LAND USE MAP OF THE SOIL STUDY AREA.....	84
FIGURE 11: PREVAILING WIND DIRECTION FOR EMALAHLENI (HTTPS://WWW.WINDFINDER.COM/WINDSTATISTICS/EMALAHLENI)	85
FIGURE 12: ELEVATION OF THE PROJECT SITE	86
FIGURE 13: VEGETATION MAPPING UNITS OF THE PROJECT SITE.....	101
FIGURE 14: ECOLOGICAL SENSITIVITY OF THE PROJECT SITE.....	102
FIGURE 15: HIGH LEVEL HYDROLOGY OF THE PROJECT SITE AND SURROUNDING AREAS	107
FIGURE 16: WETLANDS ASSOCIATED WITH THE PROJECT SITE (ORIGINAL ASSESSMENT - 2014)	108
FIGURE 17: WETLANDS ASSOCIATED WITH THE PROJECT SITE (FOLLOW UP ASSESSMENT - 2018).....	109
FIGURE 18: SITE 1 GRAVES	111
FIGURE 19: SITES 2 CEMENT AND BRICK FOUNDATIONS.....	112
FIGURE 20: SITE 3 STONE WALL FOUNDATIONS.....	112
FIGURE 21: SITE 3 CLOSER VIEW OF THE POSSIBLE HOMESTEADS	112
FIGURE 22: SITE 4 STONE WALL – SCARCELY VISIBLE.....	113
FIGURE 23: VEGETATION SENSITIVITY MAP OF THE PROJECT SITE.....	175
FIGURE 24: HERITAGE SENSITIVITY MAP OF THE PROJECT SITE.....	176
FIGURE 25: WETLAND SENSITIVITY MAP OF THE PROJECT SITE	177
FIGURE 26: SITE DEVELOPMENT PLAN	180

LIST OF TABLES

TABLE 1: LAND USE DIFFERENTIATION AND DENSITY UNITS PER HECTARE OF PINE RIDGE EXTENSION 1-4 OF THE PROPOSED DEVELOPMENT	17
TABLE 2: LAND USE DIFFERENTIATION AND DENSITY UNITS PER HECTARE OF PINE RIDGE EXTENSION 4-25 OF THE PROPOSED DEVELOPMENT	17
TABLE 3: REQUIRED WATER CAPACITY FOR DEVELOPMENT OF PINE RIDGE EXTENSION 1-4.....	20
TABLE 4: REQUIRED WATER CAPACITY FOR DEVELOPMENT OF PINE RIDGE EXTENSION 5-25.....	20
TABLE 5: ELECTRICITY LOAD ESTIMATE FOR PINE RIDGE EXTENSION 1-4.....	22
TABLE 6: ELECTRICITY LOAD ESTIMATE FOR PINE RIDGE EXTENSION 5-25.....	22
TABLE 7: LISTED ACTIVITIES TRIGGERED BY THE PROPOSED DEVELOPMENT.....	24
TABLE 8: NEED AND DESIRABILITY OF THE PROPOSED PROJECT, IN TERMS OF THE GUIDELINE ON NEED AND DESIRABILITY	32
TABLE 9: ALTERNATIVE TYPES.....	52
TABLE 10: COMMENTS AND RESPONSES REPORT	60

APPENDICES

Appendix A	-	Plans and Maps
Appendix B	-	Photographs
Appendix C	-	Public Participation
Appendix D	-	Specialist Studies
Appendix E	-	Other Information

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DEFINITIONS

Alternatives

In relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the-

- a) property on which or location where the activity is proposed to be undertaken;
 - b) type of activity to be undertaken;
 - c) design or layout of the activity;
 - d) technology to be used in the activity; or
 - e) operational aspects of the activity;
- and includes the option of not implementing the activity.

Application

An application for an Environmental Authorisation (EA).

Buffer Area

Unless specifically defined, means an area extending 10 kilometres from the proclaimed boundary of a world heritage site or national park and 5 kilometres from the proclaimed boundary of a nature reserve, respectively, or that defined as such for a biosphere.

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.

Development footprint

Any evidence of physical alteration as a result of the undertaking of any activity.

EAP

An environmental assessment practitioner as defined in section 1 of NEMA.

EMPr

An environmental management programme contemplated in regulations 19 and 23 of the EIA Regulations, 2014.

Environment

The surroundings (biophysical, social and economic) within which humans exist and that are made up of:

- (i) the land, water and atmosphere of the earth;
- (ii) micro-organisms, plant and animal life;
- (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and

- (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Impact Assessment

A systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes Basic Assessment and Scoping and Environmental Impact Reporting.

Environmental Impact Assessment Report

A report contemplated in regulation 23 of the EIA Regulations, 2014.

Independent

In 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 the EIA 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.

Indigenous Vegetation

Vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

Industrial Complex

An area used or zoned for industrial purposes, including bulk storage, manufacturing, processing or packaging purposes.

Mitigation

To anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

Phased Activities

An activity that is developed in phases over time on the same or adjacent properties to create a single or linked entity.

Plan of Study for Environmental Impact Assessment

A study contemplated in regulation 22 of the EIA Regulations that forms part of a Scoping Report and sets out how an Environmental Impact Assessment will be conducted.

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 EIA Regulations, 2014.

Scoping Report

A report contemplated in regulation 21 of the EIA Regulations, 2014.

S&EIR

The scoping and environmental impact reporting process contemplated in regulation 21 to regulation 24 of the EIA Regulations, 2014.

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.

Systematic Biodiversity Plan

A plan that identifies important areas for biodiversity conservation, taking into account biodiversity patterns (i.e. the principle of representation) and the ecological and evolutionary processes that sustain them (i.e. the principle of persistence). A systematic biodiversity plan must set quantitative targets/thresholds for aquatic and terrestrial biodiversity features in order to conserve a representative sample of biodiversity pattern and ecological processes.

Watercourse

- (a) a river or spring;
 - (b) a natural channel in which water flows regularly or intermittently;
 - (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
- a reference to a watercourse includes, where relevant, its bed and banks.

Wetland

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.

ABBREVIATIONS

BID	-	Background Information Document
CRR	-	Comments and Response Report
DARDLEA	-	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs, Mpumalanga
DWS	-	Department of Water and Sanitation
EA	-	Environmental Authorisation
EAP	-	Environmental Assessment Practitioner
EIA	-	Environmental Impact Assessment
EIR	-	Environmental Impact Report
EMF	-	Environmental Management Framework
EMP	-	Environmental Management Programme
GN	-	Government Notice
I&AP	-	Interested and Affected Party
IWULA	-	Integrated Water Use Licence Application
NEMA	-	National Environmental Management Act, Act No. 107 of 1998, as amended
NEM:WA	-	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NHRA	-	National Heritage Resources Act, Act No. 25 of 1999
R	-	Regulation
SAHRA	-	South African Heritage Resources Agency
S&EIR	-	Scoping and Environmental Impact Reporting

1. PROJECT TITLE

Township Establishment on the Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS and Portion 0 (remaining extent) of the farm Leeuwpoot 283 JS, Mpumalanga.

2. APPLICANT DETAILS

Applicant Name	Sarovic Investments CC
Contact Person	Reinet Sarovic
Postal Address	PO Box 3762, Witbank, 1035
Telephone Number	013 656 6789
Fax Number	013 656 5512
Email Address	wtbrentals@vodamail.co.za

3. ENVIRONMENTAL ASSESSMENT PRACTITIONER DETAILS

Environmental Assessment Practitioner Company	Labesh (Pty) Ltd
Contact Person	Lourens de Villiers
Postal Address	Postnet Box 469, Private Bag X504, Sinoville, 0129
Telephone Number	082 789 6525
Fax Number	086 552 6837
Email Address	admin@labesh.co.za and lourens@labesh.co.za
Qualifications	B.Sc Earth Science (North West University) Hons B.Sc Geography and Environmental Studies (North West University) M.Sc Water Resource Management (University of Pretoria)
Relevant experience	17 years' experience conducting Environmental Impact Assessment processes

The EAP's Curriculum Vitae is attached to this report under Appendix E.

4. LOCATION OF THE DEVELOPMENT FOOTPRINT

The properties for the proposed development and its associated activities are as follows:

Property/Land Parcel	21 digit Surveyor General Code
Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS	T0JS0000000029600079
Portion 0 (remaining extent) of the farm Leeuwpoot 283 JS	T0JS0000000028300000

The project location is ± 6.3 km to the north-northwest of the eMalahleni CBD and directly east (Blesboklaagte) and north (Leeuwpoot) of Pine Ridge, in the Emalahleni Local Municipality, Nkangala District Municipality, Mpumalanga Province. Direct access to both project properties is from the Saaihoek Road (D1126). Further access from Verena Road and Pineridge Township will become available later in development.

The GPS coordinates for the project site are as follows:

25°48'27.22"S; 29°12'17.76"E

A locality map, provided on the next page, shows the location of the two project properties, at an appropriate scale.

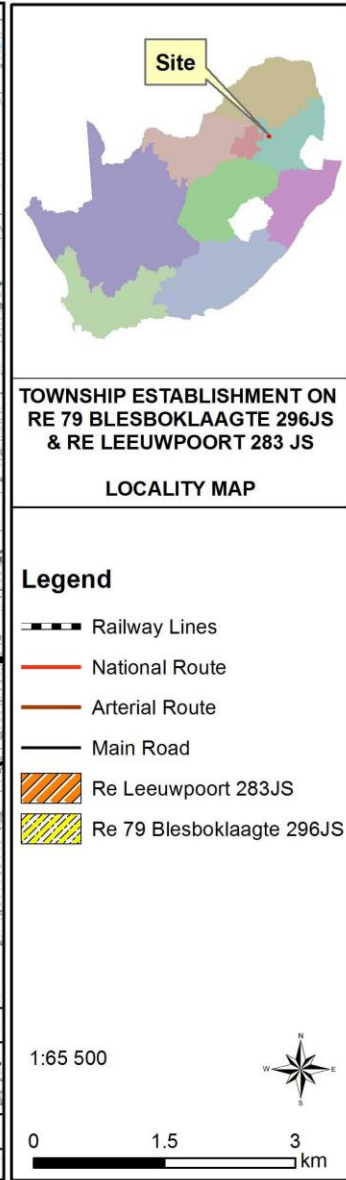


Figure 1: Site locality map

The following photos give an indication of the current status of the project properties. More photographs are given under Appendix B.



5. SCOPE OF THE PROPOSED DEVELOPMENT AND ACTIVITIES

5.1 Description of the activities to be undertaken

The project site is vacant at present and is used for cattle grazing. There are a number of cattle kraals onsite. A large quarry is also located on the northern portion of the site.

The proposed project will entail a mixed land use residential township development for the promotion of economic growth and the fulfilment of vacant residential erven needs on the following properties:

- Remaining Extent of Portion 79 of the farm Blesboklaagte 296, Registration Division J.S., Province of Mpumalanga; and
- Portion 0 (remaining extent) of the farm Leeuwpoot 283, Registration Division J.S., Province of Mpumalanga.

The two project properties are 506.8074ha in extent. The area of land that will be developed is therefore 506.8074ha.

The proposed development will be undertaken in two main phases:

Phase 1:

- A mixed density residential development is proposed on the Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS. The development will be called Pine Ridge Extension 1 – 4.
- The development will include the following land uses: Residential 1, Residential 3, Residential 4, Community Facility, Industrial 1, Business 3, Park, Commercial and Private Road.
- This development will be developed in four (4) sub-phases.
- This development will also include the provision of water-, storm water-, electricity-, sewerage- and road infrastructure.

Phase 2:

- A mixed density residential development is proposed on Portion 0 (remaining extent) of the farm Leeuwpoot 283 JS. The development will be called Pine Ridge Extension 5 – 25.
- The development will include the following land uses: Residential 1, Residential 2, Residential 3, Residential 4, Community Facility, Institutional, Business 2, Business 3, Industrial 1, Government, Park and Private Road.
- The proposed development will be developed in 21 sub-phases.
- This development will also include the provision of water-, storm water-, electricity-, sewerage- and road infrastructure.

The proposed development will consist of the following land uses and the allocation towards the different land uses is given in *Table 1*:

- Residential 1, 2, 3, and 4;
- Community Facility
- Institutional;
- Business 2 and 3;
- Industrial 1;
- Government;
- Park;
- Private park;
- Private road; and
- Commercial.

Table 1: Land use differentiation and density units per hectare of Pine Ridge Extension 1-4 of the proposed development

Proposed uses	Number of Erven	Size (ha)	Height	Coverage	FAR
Residential 1	779	23.37	2 storeys	50%	0.7
Residential 3	4	0.8224	3 storeys	30%	0.7
Residential 4	9	1.5426	5 storeys	40%	0.4
Community Facility	7	0.273	3 storeys	50%	0.7
Industrial 1	12	2.0616	3 storeys	70%	0.7
Business 3	9	1.4652	2 storeys	40%	0.4
Park	5	2.0435	N/A	N/A	N/A
Commercial	3	0.4545	3 storeys	70%	0.7
Private road	4		2 storeys	N/A	N/A

Table 2: Land use differentiation and density units per hectare of Pine Ridge Extension 4-25 of the proposed development

Proposed uses	Number of Erven	Size (ha)	Height	Coverage	FAR
Residential 1	4161	185.7478	2 storeys	50%	0.7
Residential 2	2	0.7806	2 storeys	50%	0.7
Residential 3	5	1.3949	3 storeys	30%	0.4
Residential 4	30	7.5283	5 storeys	40%	1.5
Community Facility	9	6.3298	3 storeys	50%	0.7
Institutional	12	15.1090	3 storeys	50%	0.7
Business 2	8	2.5642	3 storeys	50%	0.6
Business 3	7	3.1008	2 storeys	40%	0.4
Industrial 1	9	4.1997	3 storeys	70%	0.7
Government	2	2.1436	3 storeys	70%	0.6
Park	9	149.1692	N/A	N/A	N/A
Private park	1	3.8393	N/A	N/A	N/A
Private road		77.7912	2 storeys	N/A	N/A

The following specific land uses have been identified as part of the proposed development for Pine Ridge Extension 1-4:

- A combined business node and light industrial centre, along with some commercial stands, will be created. A buffer zone made up of high density erven that can accommodate social housing projects will be created between the business node and residential area to the north;
- Church and crèche stands have been included within the residential area; and
- Land has been earmarked for Community Facilities, for the use of clinics, sports and recreation grounds etc.

The following specific land uses have been identified as part of the proposed development for Pine Ridge Extension 5-25:

- A combined business node and industrial centre will allow ease of access due to the proximity of land uses to the district road. Directly adjacent to the business and industrial centre, on the western and southern side, will be a park as well as higher density residential erven. This will accommodate social housing projects and flats which will act as a buffer zone to the busy intersection and activities;
- Directly adjacent to the “Residential 4” erven, within the park boundary, is a grave site. This will be protected and left undisturbed;

- The “Industrial 1” erf situated on the eastern side of the district road (D1126) is proposed to accommodate a filling station servicing the newly proposed township as well as existing residential areas;
- Due to the need for formal sports and recreation facilities within the surrounding area, it is proposed to develop sport fields and related uses adjacent to the school. This will be open to the public, and will encourage the practicing and participation of sports within the community;
- All roads travelling past the school will be designated as higher order roads. This is to accommodate the increased traffic likely to be generated by the school, as well as to increase access from the surrounding areas;
- There is an expectation for a significant number of residents and customers, employees and workers to make use of public transport services such as Minibus-taxi’s and Busses along the D1126 road and into the proposed development area (or site). As such, Minibus-taxi Lay-bys should be provided strategically within the development area along the main ‘loop’ road;
- On the western boundaries of the property, a river runs through the site with wetland areas along the edge of the river. A 50m buffer has been created in the design to ensure safety and keep possible floods from reaching erven; and
- Numerous properties have been identified and earmarked for the purpose of crèches and churches. These have been placed within the residential areas as they are seen as complimentary to the residential land uses as stated within the Breaking New Ground (BNG) Policy and further supported by the Spatial Development Framework (SDF) of Emalahleni, 2013/2014.

The following was identified within the Breaking New Ground Policy as having high importance in developing sustainable human settlements and has been taken into account for this proposed development:

- Citizens should live in safe and secure environments and have adequate access to economic opportunities, a mix of safe and secure housing and tenure types, reliable and affordable basic services, educational, entertainment and cultural activities, and health, welfare and police services;
- Ensure that low-income housing is provided in close proximity to areas of opportunity;
- Ensure the development of compact, mixed land use, diverse, life-enhancing environments;
- Ensure the development of more integrated, functional and environmentally sustainable human settlements, towns and cities; and
- Multi-purpose cluster concept should be applied to ensure the sustainable provision of primary municipal facilities, such as parks, playgrounds, sports fields, crèches, community halls, taxi ranks, satellite police stations, municipal clinics and informal trading facilities.

The business node has been proposed to be towards the centre, adjacent to the river running along the western boundary of the development. This will consist of business activities as well as governmental functions and services. Furthermore, the business node is proposed to have a post office, clinic, library, community centre, shops and retail activities and a parking garage/site for public parking.

The advantages of clustering these functional facilities are summarised in the Guidelines for Human Settlement and Design (Volume 1, Chapter 5.5, 5:2005):

- Convenience, as all services are located in one centre;
- Sharing of high-cost elements can reduce costs considerably;
- Exposure for public facilities and the encouragement of their use;
- The integration of different communities;
- A reduction in inequalities in the provision of facilities;
- Offsetting of transport costs;
- Cutting down on the amount of land required;

- The promotion of full use of buildings;
- Lower building costs and running costs;
- Reduced maintenance costs; and
- A large catchment area is less susceptible to localized demographic changes.

Land uses on site

The project site is vacant at present and is used for cattle grazing. There are a number of cattle kraals onsite. A large quarry is also located on the northern portion of the site. The proposed township is situated in an area that has been earmarked for residential expansion and is within the urban edge as approved by Emalahleni local Municipality.

Near and adjacent to the project property (Pine Ridge Extension 1-4) are the following land uses:

- North: Agricultural land belonging to the developer – to be utilised for Township Establishment;
- East: Provincial District Road and Agricultural Land;
- South: Klarinet Extension 6; and
- West: Pine Ridge Township (Korsman & Associates, 2014a).

Near and adjacent to the project property (Pine Ridge Extension 5-25) are the following land uses:

- North: Agricultural Land;
- East: Provincial District Road & Agricultural Land;
- South: Proposed Pine Ridge Extension 1-4, Klarinet Extension 6, Pine Ridge Township; and
- West: Agricultural Land (Korsman & Associates, 2014b).

5.1.1 Roads and Storm Water

Access

Both Pine Ridge Extension 1-4 and Extension 5-25 of the proposed development will predominantly have direct access via the Saaihoek Road (or D1126). Alternative access will possibly be created from the Verena Road and Pine Ridge Township during later stages of the development (Phase 2). Refer to the Traffic Impact Assessment, attached under Appendix D, for more information.

Services like storm water, sewerage and water, as well as telecommunication and electricity will be accommodated in the road servitudes. These services will be accommodated according to the protocol set by Emalahleni Local Municipality in terms of positioning in the servitudes.

Surface Drainage

According to Korsman & Associates (2014a and 2014b) the road layout of the development lends itself to an adequate drainage system, as sufficient material slopes exist.

Storm water will be able to drain freely from the site via streets to curb inlets that will be provided on all internal roads and spaced according to topography and catchment size. The release of storm water from the township development to the nearby stream can be easily managed through minor outlet and energy dissipating structures located high within the 1:100 floodline area. There is possibly a need for rubbish retaining structures to be placed at the storm water outlet points.

Storm water lines are accommodated mostly in road reserves and these lines will be designed to also accommodate water runoff from higher lying adjacent townships. It is not foreseen that any problems will be encountered to accommodate the 1:2 (residential) and 1:5 year (business) return period storms on the roads and sub-surface conduits.

Street levels will be designed in such a way that streets act as storm water collectors. Storm water inlets will be placed in such a way that access to the stands is not compromised. Erosion of roads is not of concern as all streets will be paved.

Storm Water Routing

The safe routing of storm water is vital within municipal areas, and as such it will receive special attention. Retention ponds may be a consideration at bulk stands, however, this is dependent on the density that will eventually be provided on these stands. This requirement shall thereof be in accordance with the bylaws of the Local Authority and shall be provided at the detail design phase. At this stage, no retention ponds are envisaged.

Existing excavated areas to the north and northwest of the site could be utilised as retention ponds, as it is thought that those areas would be uneconomical to rehabilitate in order for development of houses to take place. Furthermore, these areas should be considered for parks and recreation areas. These areas will be adequately drained and rehabilitated according to DMR Standards and the EMP (Korsman & Associates, 2014a and 2014b).

5.1.2 Water Services

Bulk Water Availability

According to Korsman & Associates (2014a and 2014b) the impact of this development on the existing bulk water infrastructure will be quantified once the Design Engineer has been appointed for the detail design phase of both bulk and network water services.

The scale of the proposed township development at its fullest extent will have a drastic impact on the provision and distribution of bulk water, affecting both the Water Treatment Works and the storage reservoirs in Witbank as well as the bulk water lines feeding from the Witbank reservoirs to the north-western suburbs. In particular, the later phases of development will impact bulk water services drastically. A secondary water reservoir, at the least, would be required in the new area.

It is estimated that the proposed development, and its associated land uses, will require the following demand of water:

Table 3: Required water capacity for development of Pine Ridge Extension 1-4

Technical Parameter	Estimated value
Estimated total daily demand	0.406 Mℓ/d
Estimated peak flow rate based on a peak factor of 8	40 ℓ/s
Peak flow rate – Fire flow	100 ℓ/s

Table 4: Required water capacity for development of Pine Ridge Extension 5-25

Technical Parameter	Estimated value
Estimated total daily demand	3.0 Mℓ/d
Estimated peak flow rate based on a peak factor of 8	180 ℓ/s

The main water supply internally will be designed in line with fire water requirements. Pipe sizes will likely vary from 110mm diameter to 315mm diameter. All pipes will need to be designed with later phases of development in mind.

Sufficient pressure is expected for the proposed development, as the site is located relatively low compared to low level reservoirs in the Witbank area. Secondary reservoirs are likely to be needed in the area with the development of the greater western area, together with the recently established Klarinet Extension 6. The need for elevated storage systems may arise. The upgrading of bulk lines to the development should be done in accordance with the Klarinet Integrated Housing Project. These designs will be done according to a master plan for the development of the greater Pine Ridge Area.

The water line from Pap & Vleis at the railway crossing feed from the Witbank reservoirs is expected to be upgraded to serve a portion of Phase 1C and Phase 2 of Pine Ridge extension 6. However, it is unlikely that this will be sufficient for the proposed development. It is also likely that the bulk lines to Pap & Vleis will be insufficient in the long term. Further upgrading by the Local Authority, through the bulk services contribution strategy, will have to be implemented.

The Local Authority will have to plan carefully in terms of the necessary upgrading work required for bulk water services.

Internal Water Layout

The layout of the proposed township development provides sufficient street reserves for an internal water network. The network will be designed and constructed according to municipal and national standards. All stands will be equipped with separate connections that will allow for internal fire systems as well. Fire water will also be accommodated according to national and municipal standards (Korsman & Associates, 2014a and 2014b).

5.1.3 Sewerage

Bulk Sewer Conveying Availability

Most of the development is situated topographically higher than the outfall sewer draining to the Pine Ridge Sewage Pump Station. This outfall sewer line is expected to be sufficient for most of Phase 1 Klarinet Integrated Housing Development. However, no further capacity is available on the pump line to Klipspruit for the proposed development. As such, the bulk line will have to be upgraded.

Further phases of the Klarinet Integrated Housing Development will require a new outfall sewer line which, from a topographical point of view, will also serve this proposed development.

An upgraded pump station at Pine Ridge proper outfall sewer to the Klipspruit works is inevitable. This should be done in accordance with the Klarinet Integrated Housing Development as well as the Bulk Services Contribution Policy (as provided by Emalahleni Local Municipality).

Internal sewer lines will likely vary from 160mm diameter to 250mm diameter. These will drain toward a bulk outfall sewer line to be implemented by Emalahleni Local Municipality within the next 3-6 years. Certain pipes will be sized with future development in mind (Korsman & Associates, 2014a and 2014b). It is proposed that sewage from the proposed development will be treated in the municipal sewage treatment works.

5.1.4 Electricity

The proposed development lies within the Emalahleni Local Municipality distribution area. Major electrical infrastructure that is currently visibly or identified on the proposed development site were Eskom High Voltage overhead lines as well as some minor MV overhead lines.

Bulk supply to the proposed development will be from the Klarinet 22/11kV substation with a current installed capacity of 10MVA [non-firm supply] transformer available.

The estimated demand of the proposed development is calculated as follows:

Table 5: Electricity Load Estimate for Pine Ridge Extension 1-4

Proposed use	Area	Units	Loading
Residential 1	25.4798 Ha	779	2700 kVA
Residential 3	0.8227 Ha		100 kVA
Residential 4	1.5420 Ha	571	1400 kVA
Community facility	1.2516 Ha		450 kVA
Industrial 1	1.5491 Ha		550 kVA
Business 3	1.4648 Ha		500 kVA
Park	2.0435 Ha		600 kVA
Private Road	12.9555 Ha		200 kVA
TOTAL	47.109 Ha		6 500 kVA

Table 6: Electricity Load Estimate for Pine Ridge Extension 5-25

Proposed use	Area	Units	Loading
Residential 1	185.7478 Ha	4161	14564 kVA
Residential 2	0.7806 Ha	20	60 kVA
Residential 3	1.3949 Ha	93	279 kVA
Residential 4	7.5283 Ha	2823	7058 kVA
Community facility	6.3298 Ha		2216 kVA
Institutional	15,109 Ha		5289 kVA
Business 2	2,5642 Ha		821 kVA
Business 3	3.1008 Ha		993 kVA
Industrial 1	4.1997 Ha		1344 kVA
Government	2,1436 Ha		686 kVA
Park	29.8338 Ha	9	450 kVA
Private Park	0.7679 Ha	1	5 kVA
Private Road	38.8956 Ha	486	25 kVA
TOTAL	459.6984 Ha		33 800 kVA

The ADMD (After Diversity Maximum Demand) allowed for Residential Units are as follows:

- Residential 1 units – 3.5 kVA/unit
- Residential 2 units – 3.0 kVA/unit
- Residential 3 units – 3.0 kVA/unit
- Residential 4 units – 2.5 kVA/unit

The proposed development is aimed at middle and lower income level groups. As such, the loading for Business is calculated at 80 VA/m², Government Facilities at 80 VA/m² and Industrial at 40 VA/m².

The bulk electricity requirement cannot currently be provided. However adequate power should be available with the new primary substation to be built by Eskom. As such, all application processes should be exercised in tandem with the Town Planning processes.

Should the township development be approved, a service report will be prepared in order to allow the finalisation of the services agreement. Electrical Contractors will then be appointed to supply and install the municipal and consumer's electrical networks. The Electrical Engineering Report is attached under Appendix D.

5.1.5 Traffic

WSP SA Civil and Structural Engineers (Pty) Ltd. was appointed to conduct the Traffic Impact Study. It is estimated that Pine Ridge Extension 1-4 will generate approximately 850 vph during weekday AM peak hour and 1 263 vph during weekday PM peak hour. Pine Ridge Extension 5-25 is estimated to produce a maximum of 2 122 vph during both weekday AM and PM peak hours.

The Saaihoek road (D1126) is expected to experience a significant impact due to the additional development traffic. As such, the upgrading at all four (4) key intersections from a capacity viewpoint will be required (according to the SIDRA analysis). Access onto D1126 will also require upgrading.

The proposed access into the township development is located approximately 750m to the north of the access to Pine Ridge Extension 1-4. This will require a short deceleration from the south on the D1126 as well as a short separate right-turn lane from the north. Access into the development is approximated 510m north of the Flamingo Street intersection. Road widening will be required on the Saaihoek Road (D1126).

A minimum of ten (10) Minibus-taxi Lay-by's are proposed on the main road within the proposed development. The exact positions of these should be decided by the Emalahleni Local Municipality in conjunction with the local Taxi Associations.

The proposed development is feasible in terms of traffic generation and impact, and so it is supported from a traffic engineering perspective. This is in light of the proposed Lay-by's and Site Access road with the relevant road widening of road D1126 being properly designed and constructed to appropriate design standards of the relevant Road Authority. The Traffic Impact Study is attached under Appendix D.

5.2 Listed Activities triggered by the proposed development

The following listed activities are triggered by the proposed development and therefore require Environmental Authorisation, in terms of the Environmental Impact Assessment Regulations of 4 December 2014, as amended on 7 April 2017:

Table 7: Listed activities triggered by the proposed development

Government Notice and Activity Number	Wording as per the Listing Notice	Description as per the project description relating to each listed activity
Government Notice R983 (Listing Notice 1), as amended by GN No. 327 of 7 April 2017, Activity No. 11	The development of facilities or infrastructure for the transmission and distribution of electricity— (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	The development of facilities or infrastructure for the transmission and distribution of electricity, with a capacity of 275 kilovolts or more, may be required for the proposed development which lies within an urban area. These facilities are likely to include sub-stations, switchgears, voltage cables, distribution kiosks and house connections.
Government Notice R983 (Listing Notice 1), as amended by GN No. 327 of 7 April 2017, Activity No. 13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	A new bulk water reservoir(s) may be required for the storage of water for the proposed development. The reservoir(s) capacity may also exceed 50 000m ³ .
Government Notice R983 (Listing Notice 1), as amended by GN No. 327 of 7 April 2017, Activity No. 26	Residential, retail, recreational, tourism, commercial or institutional developments of 1 000 square metres or more, on land previously used for mining or heavy industrial purposes; — excluding — (i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (ii) where an environmental authorisation has been obtained for the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or (iii) where a closure certificate has been issued in terms of section 43 of the	Residential, retail, recreational, tourism, commercial, and institutional erven will form part of the proposed development. On the northern section of the site a large quarry was situated, where sand mining was likely to have been carried out in the past. The total developmental footprint will be 5 068 074m ² (or 506.807ha) in extent.

Government Notice and Activity Number	Wording as per the Listing Notice	Description as per the project description relating to each listed activity
	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land.	
Government Notice R983 (Listing Notice 1), as amended by GN No. 327 of 7 April 2017, Activity No. 28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	The proposed development is situated in an urban area and will comprise of residential, retail, recreational, tourism, commercial and institutional land uses. The total development footprint will be 5 068 074m ² (or 506.807ha). A large section of the northern and eastern portions of the site, as well as a small portion of the north western corner of the site has been historically cultivated. The site was, and is, used for cattle grazing.
Government Notice R983 (Listing Notice 1), as amended by GN No. 327 of 7 April 2017, Activity No. 47	The expansion of facilities or infrastructure for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	Existing electricity facilities or infrastructure on the site may need to expand. This expansion will possibly exceed 275 kilovolts as the development footprint increases.
Government Notice R983 (Listing Notice 1), as amended by GN No. 327 of 7 April 2017, Activity No. 67	Phased activities for all activities— (i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices; excluding the following activities listed in this Notice- 17(i)(a-d); 17(ii)(a-d); 17(iii)(a-d); 17(iv)(a-d); 17(v)(a-d); 20; 21; 22; 24(i);	The proposed development will take place in two main phases. These two phases will contain sub-phases, with Phase 1 having four (4) sub-phases and Phase 2 having ten (10) sub-phases.

Government Notice and Activity Number	Wording as per the Listing Notice	Description as per the project description relating to each listed activity
	<p>29; 30; 31; 32; 34; 54(i)(a-d); 54(ii)(a-d); 54(iii)(a-d); 54(iv)(a-d); 54(v)(a-d); 55; 61; 64; and 65; or</p> <p>(ii) listed as activities 5, 7, 8(ii), 11, 13, 16, 27(i) or 27(ii) in Listing Notice 2 of 2014 or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices; where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.</p>	
<p>Government Notice R984 (Listing Notice 2), as amended by GN No. 325 of 7 April 2017, Activity No. 6</p>	<p>The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding—</p> <p>(i) activities which are identified and included in Listing Notice 1 of 2014;</p> <p>(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;</p>	<p>The proposed development will require a Water Use Licence application, in terms of the National Water Act, 1998, for one or more of the following proposed water use activities:</p> <ul style="list-style-type: none"> • Possibly Section 21(b) - the storage of clean water in a number of dams and reservoirs onsite; • Section 21(c) - development/construction across watercourses and within 500m from the boundary of watercourses onsite; and • Section 21(i) - development/construction across watercourses and within 500m from the boundary of watercourses onsite.

Government Notice and Activity Number	Wording as per the Listing Notice	Description as per the project description relating to each listed activity
	(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.	
Government Notice R984 (Listing Notice 2), as amended by GN No. 325 of 7 April 2017, Activity No. 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The proposed developmental extent is 406.9084ha. Indigenous vegetation will be cleared as part of this development.
Government Notice R985 (Listing Notice 3), as amended by GN No. 324 of 7 April 2017, Activity No. 12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. f. In Mpumalanga: ii. Within critical biodiversity areas identified in bioregional plans.	The proposed developmental extent is 406.9084ha. Indigenous vegetation will be cleared as part of this development. Sections of the site lie within Critical Biodiversity Areas – Optimal.
Government Notice R985 (Listing Notice 3), as amended by GN No. 324 of 7 April 2017, Activity No. 26	Phased activities for all activities— i. listed in this Notice and as it applies to a specific geographical area, which commenced on or after the effective date of this Notice; or ii. similarly listed in any of the previous NEMA notices, and as it applies to a specific geographical area, which commenced on or after the effective date of such previous NEMA Notices— where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold; — excluding the following activities listed in this Notice— 7; 8; 11; 13; 20; 21; and 24.	The proposed development will take place in two main phases. These two phases will contain sub-phases, with Phase 1 having four (4) sub-phases and Phase 2 having ten (10) sub-phases.

5.3 Water Use Licence Activities

The following proposed water uses require Water Use Registration and/or Licence applications in terms of Chapter 4 of the National Water Act, 1998 (Act No. 36 of 1998):

- Possibly Section 21(b): Storage of water – the storage of clean water in a number of dams and reservoirs onsite;
- Section 21(c): Impeding or diverting the flow of water in a watercourse – development/construction across watercourses and within 500m from the boundary of watercourses onsite; and
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse - development/construction across watercourses and within 500m from the boundary of watercourses onsite.

The required Water Use Registration and/or Licence application will be submitted to the Department of Water and Sanitation in due course.

6. POLICY AND LEGISLATIVE CONTEXT OF THE APPLICATION

The following legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments are applicable to the proposed development and have or will be considered in this full Scoping and Environmental Impact Assessment process.

Legislation

- The Constitution of South Africa, 1996 (Act No. 108 of 1996), as amended
- The National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended
- The Environmental Impact Assessment Regulations of 4 December 2014, as amended on 7 April 2017
- The National Water Act, 1998 (Act No. 36 of 1998), as amended
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), as amended
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999), as amended
- The National Appeal Regulations – Government Notice No. R.993 of 8 December 2014

Plans

- The Mpumalanga Biodiversity Conservation Plan

Guidelines

- Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010

Spatial tools

- SANBI Biodiversity GIS Database

Municipal development planning frameworks

- Emalahleni Local Municipality – Spatial Development Framework Final Report – 2011
- Emalahleni Local Municipality – Spatial Development Framework Final Report – 2013/2014
- Emalahleni Local Municipality - The Integrated Municipal Environmental
- Emalahleni Local Municipality – Reviewed and Approved Integrated Development Plan 2013/2014

7. MOTIVATION FOR THE NEED AND DESIRABILITY OF THE PROPOSED DEVELOPMENT

7.1 Need and desirability of the development in the context of the preferred location

An increasing number of residential developments are taking place in Witbank due to the constant growth in the property market. As a result, a shortage of subsequent land uses has arisen with more and more property developers paying exorbitant prices for vacant land.

The Emalahleni region has also experienced growth in its most important sector, the mining and industrial sector, over and above growth in residential markets. The growth in the mining and industrial sector will create more employment opportunities in the area in the short, medium and long term. This will directly impact on the demand for housing and vacant industrial sites in Witbank.

Due to the need for the establishment of this specific Land Development Area, the proposed township development can be seen as an infill development as it is strategically located in relation to the existing townships. Klarinet Extension 6 is located to the south of the Pine Ridge development. Furthermore, the Spatial Development Framework of Emalahleni has earmarked the proposed site for Residential Expansion in 2011 and as an Urban Settlement Growth Area in 2013/2014.

Infill development has been emphasised by both the Development Facilitation Act, 1995 (DFA) and the Integrated Development Plans for Emalahleni Local Municipality. This is highlighted in order to:

- Discourage the phenomenon of urban sprawl in urban areas;
- Contribute to the optimum use on undeveloped land;
- Infill development on vacant land within the municipal boundary; and
- Contribute to the optimum use of infrastructure, engineering services and social facilities

The proposed township development will be developed in 21 phases according to the extensions, whilst taking into consideration the size of the development.

Furthermore, the proposed development is considered desirable due to:

- Accessibility to the site is easily reachable via local and provincial roads (this is via the existing Klarinet Extension 6 and Pine Ridge Proper, as well as the provincial road on the eastern boundary of the site);
- The nature and scale of the township development fits into the general character of the area as the proposed density (one dwelling unit per 300m²) is compatible with housing developments in and around the area. Further provision of erven up to a maximum stand size of 872m² has been created in order to have a mixed density development;
- Diversification of the residential structure of the area is provided by alternative and affordable forms of housing through the proposed development;
- The proposed industrial area will answer to the increasing need and availability of industrial/business (or retail) stands;
- Due to undermining, which poses a constraint to expansion and development, the site is ideal for mixed use development;
- A site development plan will be created in conjunction with the proposed development, allowing the Emalahleni Local Municipality to consider aspects of the development, such as siting of buildings, landscaping, impact of development on surrounding properties, etc. before approval of building plans; and

- The proposed high-rise residential buildings will create a buffer between the industrial area and the existing residential developments to the north-eastern side of development.

7.2 Need and Desirability in terms of the Guideline on Need and Desirability

The Department of Environmental Affairs published a Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010, in Government Notice 891 of 2014 (20 October 2014).

The table below indicates how the guideline requirements have been addressed.

Table 8: Need and desirability of the proposed project, in terms of the Guideline on Need and Desirability

Requirement	Part where requirement is addressed/response
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area? ¹	<p>The proposed development will take place on land that is currently vacant and has been used for the grazing of livestock.</p> <p>The impact of the proposed development on the ecological integrity of the project property has been evaluated in further detail in this report. Please refer to Sections 9.6 and 9.7 of this report.</p>
1.1. How were the following ecological integrity considerations taken into account?	
1.1.1 <i>Threatened Ecosystems.</i> ²	<p>The site is situated within the Vulnerable Rand Highveld Grassland. To take into consideration any threatened ecosystems that may be present on the project site, the following specialist studies were commissioned as part of this Environmental Impact Assessment process:</p> <ul style="list-style-type: none"> • A Wetland/Riparian Delineation and Functional Assessment; • A Baseline Aquatic Report; and • A Fauna Assessment and Flora Assessment. <p>These studies identified the risks and impacts of the proposed project. These have been evaluated in further detail in this report.</p>
1.1.2 <i>Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.</i> ³	<p>To take into consideration any sensitive, vulnerable, highly dynamic or stressed ecosystems that may be present on the project site, the following specialist studies were commissioned as part of this Environmental Impact Assessment process:</p> <ul style="list-style-type: none"> • A Wetland/Riparian Delineation and Functional Assessment; • A Baseline Aquatic Report; and • A Fauna Assessment and Flora Assessment.

¹ Section 24 of the Constitution and section 2(4)(a)(vi) of NEMA refer.

² Must consider the latest information including the notice published on 9 December 2011 (Government Notice No. 1002 in Government Gazette No. 34809 of 9 December 2011 refers) listing threatened ecosystems in terms of Section 52 of National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).

³ Section 2(4)(r) of NEMA refers.

Requirement	Part where requirement is addressed/response
	These studies identified the risks and impacts of the proposed project. These have been evaluated in further detail in this report.
1.1.3 Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs").	A Fauna and Flora Assessment was conducted for the project site. According to the Fauna and Flora Assessment and the Mpumalanga Biodiversity Sector Plan, the majority of the project site is listed as "No Natural Habitat Remaining" and "Least Concern". On the northern boundary of the site, a portion is classified as "Important and Necessary".
1.1.4 Conservation targets.	The conservation target for the Rand Highveld Grassland is 24% (Mucina & Rutherford, 2006).
1.1.5 Ecological drivers of the ecosystem.	Mitigation measures have been incorporated into the Environmental Impact Assessment Report and Environmental Management Programme for this project. The measures aim to mitigate the influence of ecological drivers such as the influence of uncontrolled fires, human activity and alien invasive plant species.
1.1.6 Environmental Management Framework.	<p>The Emalahleni Municipality does not yet have an Environmental Management Framework (as far as can be determined). It does, however, make use of an Integrated Municipal Environmental Policy (IMEP). The following has been extracted from the IMEP for the Municipality:</p> <p>Water Resources</p> <p>The Municipality commits to "ensuring that the quality of inland waters, streams and rivers of the Municipality is suitable for the maintenance of biodiversity, the protection of human health"</p> <p>Landforms and Soils</p> <p>The Municipality "recognizes that the conservation and enhancement of landform and soils in the Municipality is essential for:</p> <ul style="list-style-type: none"> • The conservation of fauna, flora and the Municipal's unique biodiversity. • Human activities such as farming and gardening.

Requirement	Part where requirement is addressed/response
	<ul style="list-style-type: none"> • Minimizing soil erosion. • Protecting the landscapes of the Municipality.” <p>Fauna and Flora</p> <p>The Municipality commits to the conservation of biodiversity through:</p> <ul style="list-style-type: none"> • “The improvement, enhancement and protection of endemic biodiversity. • Recognizing that the conservation and protection of terrestrial biodiversity is a priority. • Recognizing and protecting the marine environment and biodiversity of the Municipality. • Recognizing that the Municipal’s most valuable resource is its natural environment which provides a range of essential goods and services. • Recognizing the negative impacts of invasive alien species on the environment. • Prioritizing fire management within the Municipal’s boundaries. • Ensuring sustainable and equitable land-use practices within the Municipality.” <p>Urbanization and Housing</p> <p>The Municipality commits to:</p> <ul style="list-style-type: none"> • “The promotion of clean, healthy, safe and efficient living environments, which take communities, their needs and the surrounding environment into account. • Emphasis being placed on upgrading the living environments of the urban poor. • Recognizing the need to manage uncontrolled urban expansion, which threatens the resources of the Municipality and lead to unwanted social, environmental and economic costs, by working towards creating a more compact municipal area.

Requirement	Part where requirement is addressed/response
	<ul style="list-style-type: none"> • Recognizing the impact of light pollution. • Recognizing that an effective Municipal Open Space System (MOSS) is essential to the protection of biodiversity in the Municipality and ensuring access to recreational opportunities for all.” <p>As can be seen by the above, the municipality aims to encourage development without damaging the environment. This development encourages the fulfilment of these goals.</p>
<p>1.1.7 <i>Spatial Development Framework.</i></p>	<p>According to the Emalahleni Local Municipality Spatial Development Framework (SDF), the property is located in an area identified as Strategic Development Areas (Residential Expansion) (Emalahleni, 2011). It has also been identified as Urban Settlement Growth Areas (USGA) (Emalahleni, 2014). The proposed project is therefore in line with the Emalahleni Local Municipality SDF and will contribute towards the future short term spatial vision of Emalahleni in the following ways:</p> <p>Strategic objective: Capitalise on the regional spatial development initiatives.</p> <p>Proposed development: The proposed development will complement and contribute to the fulfilment of housing needs in the Emalahleni area. This is imperative given the housing backlog that the Municipality is facing.</p> <p>Strategic objective: Economic development and job creation supporting and guiding the spatial development pattern of Mpumalanga.</p> <p>Proposed development: This proposed development is placed in a strategic position within the Emalahleni area, providing not only economic development to the area with the provision of a business and industrial node, but also economic diversification and job creation in the region.</p> <p>Strategic objective: Accommodating urbanisation within the Province.</p>

Requirement	Part where requirement is addressed/response
	<p>Proposed development: The proposed development will contribute to the formalisation of housing in the Pine Ridge area, whilst also acting as an infill development. This fulfils the need for urbanisation without adding to urban sprawl.</p> <p>Strategic objective: Infrastructure Investment in urban and rural priority areas.</p> <p>Proposed development: The proposed development will contribute to the implementation of new infrastructure in the Emalahleni area, not only in terms of formal housing, but provision of services, including water and sanitation, and business and industrial activities.</p>
1.1.8 <i>Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).⁴</i>	The proposed activities do not have significant contributions towards global and international responsibilities.
1.2 How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts? ⁵	<p>Fauna and Vegetation Assessments were conducted for the proposed project site. The purpose of the studies was to determine the current status of the project site and the impact that the proposed development will have on fauna and flora assemblages. The findings of the assessments are presented under Section 8.3.3 of this report. The development will cover most of the site. A buffer has been created surrounding the wetland and riparian areas, which is important for the conservation of fauna. Areas of high conservation concern should be included in open space, as far as possible. Refer also to Sections 9.6 and 9.7 of this report.</p> <p>Mitigation measures have been further identified and recommended in the EMP to mitigate negative environmental impacts.</p>
1.3 How will this development pollute and/or degrade the biophysical environment? What	Negative environmental impacts associated with the proposed development

⁴ Section 2(4)(n) of NEMA refers.

⁵ Section 24 of the Constitution and Sections 2(4)(a)(i) and 2(4)(b) of NEMA refer.

Requirement	Part where requirement is addressed/response
<p>measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?⁶</p>	<p>have been identified and assessed in Sections 9.6 and 9.7 of this report. Mitigation measures have also been identified and recommended in the Environmental Impact Assessment Report and EMPr to mitigate negative environmental impacts.</p> <p>The main positive impacts of the proposed development are the generation of job opportunities and the stimulation of the economy and housing sector. To enhance the positive impacts, local people will be employed during the construction and operational phases of the development, as far as possible.</p>
<p>1.4 What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?⁷</p>	<p>During the construction phase of the proposed development waste, such as building rubble and domestic waste, will be generated. Some hazardous waste, such as spilt oil or diesel may also be generated. Mitigation measures to minimise, reuse and/or recycle the waste have been recommended in the Environmental Impact Assessment Report and Environmental Management Programme for the project.</p>
<p>1.5 How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?⁸</p>	<p>A Phase 1 Heritage Impact Assessment was conducted for the project site. The assessment found the following heritage artefacts or resources at the site:</p> <ul style="list-style-type: none"> • A grave site with at least ten (10) graves. The cultural significance of the graves is considered to be high. If disturbance is likely, the protection of the grave site is best achieved by fencing the area without limiting access by family members. Graves should be relocated (after all due processes have been followed) if they are to be impacted on by the development. • Three sites related to recent farming activities in the area. This includes the foundations of a recent homestead, stone packed remains of livestock enclosures and possible labourer homestead remains. The

⁶ Section 24 of the Constitution and Sections 2(4)(a)(ii) and 2(4)(b) of NEMA refer.

⁷ Section 24 of the Constitution and Sections 2(4)(a)(iv) and 2(4)(b) of NEMA refer.

⁸ Section 24 of the Constitution and Sections 2(4)(a)(iii) and 2(4)(b) of NEMA refer.

Requirement	Part where requirement is addressed/response
	<p>cultural significance is low to medium, and no further mitigation is required.</p> <p>The proposed development should be halted if any other unknown objects, sites or features of an archaeological nature are uncovered during development activities, until inspection and recommendations of the way forward can be given.</p>
<p>1.6 How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?⁹</p>	<p>The proposed development will likely use one or more of the following non-renewable natural resources: diesel, petrol, LPG and coal. This includes, for example, diesel and petrol used in construction vehicles and LPG that will potentially be used in residential homes for cooking and heating.</p> <p>Mitigation measures have been recommended in the Environmental Management Programme for this proposed development, to minimise the usage of non-renewable natural resources.</p>
<p>1.7 How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?¹⁰</p>	<p>The proposed development will not use or impact upon any renewable natural resources.</p>
<p>1.7.1 <i>Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their</i></p>	<p>The proposed development should decrease the dependency on the use of resources. By situating residences in close proximity to amenities such as shops, the proposed project will promote travelling on foot, as opposed to</p>

⁹ Section 24 of the Constitution and Sections 2(4)(a)(v) and 2(4)(b) of NEMA refer.

¹⁰ Section 24 of the Constitution and Sections 2(4)(a)(vi) and 2(4)(b) of NEMA refer.

Requirement	Part where requirement is addressed/response
<i>ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)</i>	using vehicles that run on diesel or petrol.
1.7.2 <i>Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)</i>	The resource use is justifiable and should not affect intra- and intergenerational equity. Mitigation measures have been recommended in the Environmental Management Programme for this proposed development, to minimise the usage of resources.
1.7.3 <i>Do the proposed location, type and scale of development promote a reduced dependency on resources?</i>	Yes. By situating residences in close proximity to amenities such as shops, the proposed project will promote travelling on foot, as opposed to using vehicles that run on diesel or petrol.
1.8 How were a risk-averse and cautious approach applied in terms of ecological impacts? ¹¹	The proposed development's layout has been done with cognisance of both the conservation needs of the presence of a wetland as well as the associated 1:100 year flood line. Thus, a buffer has been created in order to protect both the wetland and riparian area and the housing development. Refer also to Sections 9.6 and 9.7 of this report.
1.8.1 <i>What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?</i>	<p>Areas of high fauna and vegetation conservation concern should not be developed, but instead should form part of open space, as far as possible.</p> <p>Cumulative impacts have been further assessed as part of the Environmental Impact Assessment phase and all impacts have been rated during this phase.</p> <p>The recommendations of the Traffic Impact Assessment may change based on discussions with the relevant authorities regarding the required upgrades and contributions.</p> <p>The following assumptions have been made:</p> <ul style="list-style-type: none"> • That all research and reference sources or material is accurate and up to date;

¹¹ Section 24 of the Constitution and Section 2(4)(a)(vii) of NEMA refer.

Requirement	Part where requirement is addressed/response
	<ul style="list-style-type: none"> That the project information, as provided by the applicant and project manager, is correct; and That the specialist opinions are scientifically grounded and accurate.
1.8.2 <i>What is the level of risk associated with the limits of current knowledge?</i>	It is Labesh's opinion that the level of risk associated with the limits of current knowledge is <i>low</i> .
1.8.3 <i>Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</i>	A risk-averse and cautious approach was applied to the Scoping- and Environmental Impact Assessment Phases by keeping in mind the gaps in knowledge and limitations, such as time constraints for the specialist studies that have been conducted.
1.9 How will the ecological impacts resulting from this development impact on people's environmental right in terms following: ¹²	
1.9.1 <i>Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</i>	Section 9.6 of this report provides a list of the anticipated impacts from the proposed development. Section 9.10 provides some mitigation measures for these impacts and the Environmental Management Programme for the proposed development has more detailed mitigation measures that should be applied to minimise the impacts on the environment from the development.
1.9.2 <i>Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?</i>	The main positive impacts of the proposed development are the generation of job opportunities and the stimulation of the economy and housing sector. Furthermore, the development can be seen as an infill development, in addition to fulfilling the great demand for housing in the area. To enhance the positive impacts, local people will be employed during the construction and operational phases of the development, as far as possible.
1.10 Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Refer to Sections 9.6 and 9.7 of this report.
1.11 Based on all of the above, how will this development positively or negatively impact on	Refer to Sections 9.6 and 9.7 of this report.

¹² Section 24 of the Constitution and Sections 2(4)(a)(viii) and 2(4)(b) of NEMA refer.

Requirement	Part where requirement is addressed/response
ecological integrity objectives/targets/considerations of the area?	
1.12 Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations? ¹³	Refer to Section 8.1 of this report.
1.13 Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area? ¹⁴	Refer to Sections 9.6 and 9.7 of this report.
2.1 What is the socio-economic context of the area, based on, amongst other considerations,	the following considerations?
2.1.1 <i>The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,</i>	The Emalahleni Local Municipality Integrated Development Plan has identified the portion of land of the proposed development as an urban settlement growth area. It has noted that there is a need for <i>housing delivery targets to be met</i> (to deal with the housing backlog), <i>improved linkages to the greater Emalahleni urban area to be made</i> and <i>the development of nodes in these areas</i> . The proposed development is in line with these needs, as identified in the IDP.
2.1.2 <i>Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),</i>	The Emalahleni Local Municipality Integrated Development Plan identifies the need for <i>housing delivery targets to be met</i> (to deal with the housing backlog), <i>improved linkages to the greater Emalahleni urban area to be made</i> and <i>the development of nodes in these areas</i> . The proposed development is in line with these needs, as identified in the IDP.
2.1.3 <i>Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and</i>	The proposed development is in line with the Emalahleni Local Municipality Spatial Development Framework (SDF), as discussed previously under point 1.1.7.

¹³ Section 2(4)(b) of NEMA refer.

¹⁴ Regulations 22(2)(i)(j), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.

Requirement	Part where requirement is addressed/response
2.1.4 <i>Municipal Economic Development Strategy ("LED Strategy").</i>	The Emalahleni Local Municipality LED strategy was formulated in 2012 to create an industrial hub of the Mpumalanga Province through sustainable, efficient and effective economic growth, development and empowerment of the community. The proposed development is in line with these needs, as identified by the LED strategy.
2.2 Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	<p>The following socio-economic impacts of the proposed development could be created:</p> <ul style="list-style-type: none"> • Generation of a large number of job opportunities; • Stimulation of the economy and housing sector; and • Potential increase in crime due to the influx of workers, especially during the construction phase. <p>Job creation is a socio-economic objective of the area.</p>
2.2.1 <i>Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?</i>	The Emalahleni Local Municipality's LED has identified the importance of the creation of decent job opportunities as well as community development and economic empowerment. Job creation is a socio-economic objective of the area and the proposed development will create a large number of job opportunities. Furthermore, it will fulfil housing needs whilst being an infill development that will create greater community cohesion.
2.3 How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities? ¹⁵	<p>The proposed development will address a number of specific needs of the community, namely the provision of:</p> <ul style="list-style-type: none"> • Housing; • Amenities; • Open spaces; • Job opportunities; • Meeting places and community centres; • A Post Office, schools and crèches; and

¹⁵ Section 2(2) of NEMA refers.

Requirement	Part where requirement is addressed/response
	<ul style="list-style-type: none"> Clinics and doctor's rooms.
2.4 Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? ¹⁶ Will the impact be socially and economically sustainable in the short- and long-term?	It is expected for the proposed development to result in equitable impact distributions in the short- and long-term as well as to be socially and economically sustainable in the short- and long-term.
2.5 In terms of location, describe how the placement of the proposed development will: ¹⁷	
2.5.1 <i>result in the creation of residential and employment opportunities in close proximity to or integrated with each other,</i>	The development has been created in such a way as to promote the interconnectedness of residential and local amenities (in the form of the business and industrial node). The development will likely generate a large number of employment opportunities in the short-term, whilst creating future job opportunities into the long-term owing to the business and industrial node.
2.5.2 <i>reduce the need for transport of people and goods,</i>	By situating residences in close proximity to amenities such as shops, the proposed project will promote travelling on foot, as opposed to using vehicles that run on diesel or petrol.
2.5.3 <i>result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),</i>	The proposed development will result in densification by situating residences in close proximity to amenities such as shops. This is further enhanced by the fact that the development can be seen as an infill development. Specific Lay-by's for public transport will be positioned at strategic points along Road D1126 at the main access and within the development.
2.5.4 <i>compliment other uses in the area,</i>	The proposed development will provide formal housing for lower and middle income groups, including for those already settled in the greater area. As an infill development, the development will increase connectedness between and within the township/s.
2.5.5 <i>be in line with the planning for the area,</i>	The proposed development is in line with the development goals of the Emalahleni Local Municipality.
2.5.6 <i>for urban related development, make use of underutilised land available with the urban</i>	The proposed development is considered an infill development within the

¹⁶ Sections 2(2) and 2(4)(c) of NEMA refers.

¹⁷ Section 3 of the Development Facilitation Act, 1995 (Act No. 67 of 1995) ("DFA") and the National Development Plan refer.

Requirement	Part where requirement is addressed/response
edge,	urban edge and therefore makes use of underutilised land.
2.5.7 <i>optimise the use of existing resources and infrastructure,</i>	The proposed development will make use of existing road infrastructure to the project site.
2.5.8 <i>opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),</i>	The proposed development will make use of existing road infrastructure to the project site.
2.5.9 <i>discourage "urban sprawl" and contribute to compaction/densification,</i>	The proposed project, by providing residential erven in close proximity to Witbank, as well as other township developments in the area, will discourage "urban sprawl" and contribute to compaction/densification. This is especially applicable to this development as it is considered an infill development.
2.5.10 <i>contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,</i>	The proposed development will make use of existing road infrastructure to the project site. The proposed development is considered an infill development.
2.5.11 <i>encourage environmentally sustainable land development practices and processes,</i>	Environmentally sustainable land development practices and processes will be encouraged through specific mitigation measures that have been included in the Environmental Management Programme for this project. Open spaces have been incorporated into the proposed development's layout to ensure that the environment is retained within the development.
2.5.12 <i>take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),</i>	The location for the proposed development is strategically ideal for the following reasons: <ul style="list-style-type: none"> • The site has existing access roads to it; • The site is situated in close proximity to Emalahleni (Witbank); and • The site is close to existing townships in the area.
2.5.13 <i>the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),</i>	Investment in the proposed development will result in high socio-economic returns for the area. It is expected to create employment opportunities as well as contribute to the support of the existing economy of the area.
2.5.14 <i>impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and</i>	A Phase 1 Heritage Impact Assessment was conducted for the project site. The assessment found the following heritage artefacts or resources at the

Requirement	Part where requirement is addressed/response
	<p>site:</p> <ul style="list-style-type: none"> • A grave site with at least ten (10) graves. The cultural significance of the graves is considered to be high. If disturbance is likely, the protection of the grave site is best achieved by fencing the area without limiting access by family members. Graves should be relocated (after all due processes have been followed) if they are to be impacted on by the development; • Three sites related to recent farming activities in the area. This includes the foundations of a recent homestead, stone packed remains of livestock enclosures and possible labourer homestead remains. The cultural significance is low to medium, and no further mitigation is required. <p>The proposed development should be halted if any other unknown objects, sites or features of an archaeological nature are uncovered during development activities, until inspection and recommendations of the way forward can be given.</p>
<p>2.5.15 <i>in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?</i></p>	<p>It is expected for the proposed development to create a more integrated settlement, by situating residences in close proximity to amenities such as those found within the business and industrial node.</p>
<p>2.6 How were a risk-averse and cautious approach applied in terms of socio-economic impacts?:¹⁸</p>	<p>A risk-averse and cautious approach was applied to the Scoping- and Environmental Impact Assessment Phases by keeping in mind the gaps in knowledge and limitations, such as time constraints for the specialist studies that have been conducted.</p>
<p>2.6.1 <i>What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?</i>¹⁹</p>	<p>Areas of high fauna and vegetation conservation concern should not be developed, but instead should form part of open space, as far as possible.</p>

¹⁸ Section 2(4)(a)(vii) of NEMA refers.

¹⁹ Section 24(4) of NEMA refers.

Requirement	Part where requirement is addressed/response
	<p>Cumulative impacts have been further assessed as part of the Environmental Impact Assessment phase and all impacts have been rated during this phase.</p> <p>The recommendations of the Traffic Impact Assessment may change based on discussions with the relevant authorities regarding the required upgrades and contributions.</p> <p>The following assumptions have been made:</p> <ul style="list-style-type: none"> • That all research and reference sources or material is accurate and up to date; • That the project information, as provided by the applicant and project manager, is correct; and • That the specialist opinions are scientifically grounded and accurate.
2.6.2 <i>What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?</i>	It is Labesh's opinion that the level of risk associated with the limits of current knowledge is <i>low</i> .
2.6.3 <i>Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</i>	A risk-averse and cautious approach was applied to the Scoping- and Environmental Impact Assessment Phases by keeping in mind the gaps in knowledge and limitations, such as time constraints for the specialist studies that have been conducted.
2.7 How will the socio-economic impacts resulting from this development impact on people's	environmental right in terms following:
2.7.1 <i>Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</i>	It is not expected for the proposed development to impact significantly on people's health, safety and social ills.
2.7.2 <i>Positive impacts. What measures were taken to enhance positive impacts?</i>	The main positive impacts of the proposed development are the generation of job opportunities and the stimulation of the economy and housing sector. To enhance the positive impacts, local people will be employed during the construction and operational phases of the development, as far as possible.

Requirement	Part where requirement is addressed/response
2.8 Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	The development's socio-economic impacts will indirectly result in the consumption of natural resources, such as water. However, the usage of the resources is not considered to be an over-utilisation and resources would have been utilised in any event, albeit at a different locality. For example, people moving to the residential area of the proposed development will use water, but would have used water at their previous residences also.
2.9 What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations? ²⁰	Refer to Section 8.1 of this report.
2.10 What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? ²¹ Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to Section 8.1 of this report. The alternatives considered allow for the "best practicable environmental option" to be selected.
2.11 What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination? ²²	Local labourers will be employed, as far as possible and up to certain skill levels, depending on the work involved.
2.12 What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle? ²³	To ensure that responsibility for the environmental health and safety consequences of the development has been addressed, mitigation measures have been identified in this report and the EMPr. The responsibility for implementing the mitigation measures lies with the applicant.
2.13 What measures were taken to:	

²⁰ Section 2(4)(b) of NEMA refers.

²¹ Section 2(4)(c) of NEMA refers.

²² Section 2(4)(d) of NEMA refers.

²³ Section 2(4)(e) of NEMA refers.

Requirement	Part where requirement is addressed/response
2.13.1 ensure the participation of all interested and affected parties,	A public participation process was conducted, in accordance with the EIA Regulations, 2014, and also taking the following into consideration: <ul style="list-style-type: none"> • GN 807 - Public Participation Guideline in the Environmental Impact Assessment Process, 2012; and • The Promotion of Access to Information Act (PAIA), 2000.
2.13.2 provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, ²⁴	The public participation process for this project is open to all parties. Site notices and a newspaper advertisement were placed to encourage participation from a wider audience than simply the adjacent land owners.
2.13.3 ensure participation by vulnerable and disadvantaged persons, ²⁵	The public participation processes were open to all individuals, also to vulnerable and disadvantaged persons.
2.13.4 promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means, ²⁶	All employees, contractors and sub-contractors will be required to attend environmental awareness inductions (training).
2.13.5 ensure openness and transparency, and access to information in terms of the process, ²⁷	<p>A public participation process was conducted, in accordance with the EIA Regulations, 2014, and also taking the following into consideration:</p> <ul style="list-style-type: none"> • GN 807 - Public Participation Guideline in the Environmental Impact Assessment Process, 2012; and • The Promotion of Access to Information Act (PAIA), 2000. <p>The public participation process was open to participation from any members of the public and was a fully transparent process. All comments received from Interested and Affected Parties has been included in the reports for this project and have also been responded to/addressed. The reports are available to any person wishing to review and comment upon the reports.</p>

²⁴ Section 2(4)(f) of NEMA refers.

²⁵ Section 2(4)(f) of NEMA refers.

²⁶ Section 2(4)(h) of NEMA refers.

²⁷ Section 2(4)(k) of NEMA refers.

Requirement	Part where requirement is addressed/response
2.13.6 ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge ²⁸ , and	A public participation process was conducted, in accordance with the EIA Regulations, 2014, and also taking the following into consideration: <ul style="list-style-type: none"> • GN 807 - Public Participation Guideline in the Environmental Impact Assessment Process, 2012; and • The Promotion of Access to Information Act (PAIA), 2000.
2.13.7 ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted? ²⁹	A public participation process was conducted, in accordance with the EIA Regulations, 2014, and also taking the following into consideration: <ul style="list-style-type: none"> • GN 807 - Public Participation Guideline in the Environmental Impact Assessment Process, 2012; and • The Promotion of Access to Information Act (PAIA), 2000.
2.14 Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)? ³⁰	Local labourers will be employed, as far as possible and up to certain skill levels, depending on the work involved.
2.15 What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected? ³¹	All employees, contractors and sub-contractors will be required to attend environmental awareness inductions (training). This will include informing workers that they have the right to refuse work should the work be harmful to human health or the environment.
2.16 Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1 the number of temporary versus permanent jobs that will be created,	It is estimated that the proposed development will generate a total of 3 000 job opportunities, over the construction and operational phases.
2.16.2 whether the labour available in the area will be able to take up the job opportunities (i.e.	Local labourers will be employed, as far as possible and up to certain skill

²⁸ Section 2(4)(g) of NEMA refers.

²⁹ Section 2(4)(q) of NEMA refers.

³⁰ x

³¹ Section 2(4)(j) of NEMA refers.

Requirement	Part where requirement is addressed/response
<i>do the required skills match the skills available in the area),</i>	levels, depending on the work involved.
2.16.3 <i>the distance from where labourers will have to travel,</i>	Labourers will be transported to and from the construction site. Using local labourers (as far as possible) will decrease travel distances.
2.16.4 <i>the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and</i>	Job opportunities will be created at the proposed development site.
2.16.5 <i>the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).</i>	The proposed development will create job opportunities and should not impact upon employment opportunities in other sectors.
2.17 What measures were taken to ensure:	
2.17.1 <i>that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and</i>	Relevant environmental and town planning legislation was considered and adhered to during the Environmental Impact Assessment and Land Use Rights processes. Also refer to Chapter 6 of this report.
2.17.2 <i>that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?</i>	A public participation process was conducted, in accordance with the EIA Regulations, 2014, and also taking the following into consideration: <ul style="list-style-type: none"> • GN 807 - Public Participation Guideline in the Environmental Impact Assessment Process, 2012; and • The Promotion of Access to Information Act (PAIA), 2000.
2.18 What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage? ³²	Open spaces have been incorporated into the proposed development's layout to ensure that the environment is retained within the development together with people's beneficial use of this amenity. Mitigation measures have been included in the Environmental Management Programme for this development to minimise the impacts of the proposed development on the environment.
2.19 Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left? ³³	The mitigation measures have been elaborated in the EMP for this project. Any long-term environmental legacy or burden will also be discussed in the

³² Section 2(4)(o) of NEMA refers.

³³ Section 240(1)(b)(iii) of NEMA and the National Development Plan refer.

Requirement	Part where requirement is addressed/response
	Environmental Impact Assessment Report.
2.20 What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment? ³⁴	The applicant will be responsible for any costs associated with the remediation of pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects.
2.21 Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations? ³⁵	Refer to Section 8.1 of this report.
2.22 Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area? ³⁶	Cumulative impacts have been described in Sections 9.6 and 9.7 of this report.

³⁴ Section 2(4)(p) of NEMA refers.

³⁵ Section 2(4)(b) of NEMA refers.

³⁶ Regulations 22(2)(i)(j), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.

7.3 Need and Desirability: Motivation for the preferred development footprint within the approved site as contemplated in the accepted Scoping Report

Please refer to Section 8 below for the motivation for the preferred development footprints within the approved site (as contemplated in the accepted Scoping Report).

8. PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE

8.1 Alternatives considered

According to the Western Cape Department of Environmental Affairs and Development Planning's Guideline on Alternatives (2010), the following alternatives can be assessed:

Table 9: Alternative Types

Alternative Type	Explanation/Examples
Location	Refers to both alternative properties as well as alternative sites on the same property.
Activity	Incineration of waste rather than disposal at a landfill site/Provision of public transport rather than increasing the capacity of roads.
Design or Layout	Design: e.g. Different architectural and or engineering designs Site Layout: Consideration of different spatial configurations of an activity on a particular site (e.g. siting of a noisy plant away from residences).
Technological	Consideration of such alternatives is to include the option of achieving the same goal by using a different method or process (e.g. 1 000 megawatt of energy could be generated using a coal-fired power station or wind turbines).
Demand	Arises when a demand for a certain product or service can be met by some alternative means (e.g. the demand for electricity could be met by supplying more energy or using energy more efficiently by managing demand).
Input	Input alternatives are applicable to applications that may use different raw materials or energy sources in their process (e.g. industry may consider using either high sulphur coal or natural gas as a fuel source).
Routing	Consideration of alternative routes generally applies to linear developments such as power line servitudes, transportation and pipeline routes.
Scheduling and Timing	Where a number of measures might play a part in an overall programme, but the order in which they are scheduled will contribute to the overall effectiveness of the end result.
Scale and Magnitude	Activities that can be broken down into smaller units and can be undertaken on different scales (e.g. for a housing development there could be the option of 10, 15 or 20 housing units. Each of these alternatives may have different impacts).
"No-Go Option"	This is the option of not implementing the proposed activity.

Alternative Assessments must always include the "No-Go Option" as the baseline against which all other alternatives must be measured. The following alternatives could be considered for the proposed project:

- Location – Alternative properties and alternative sites on the same property;
- Design/Layout;
- Scale and Magnitude; and
- "No-Go Option".

Alternatives were considered in a qualitative manner.

8.1.1 Location

Alternative properties

As the applicant only owns the two properties relevant to this application, and also only wishes to develop these two properties, no property alternatives could be considered. The suitability and feasibility of the two project properties for the proposed project is demonstrated by the following:

- The properties are situated with direct access to the D1126 Road (Saaihoek Road) and could therefore be regarded as easily accessible from the surrounding townships as well as Witbank;
- The properties are situated within areas earmarked as Urban Settlement Growth Areas and Strategic Development Areas according to the municipality's spatial planning;
- The properties are situated in close proximity to existing townships (Klarinet and Pine Ridge); and
- Given the proximity to existing townships, this development can be seen as an infill development, further limiting urban sprawl.

Alternative sites on the same property

A Site Sensitivity Mapping Exercise was used to identify the most suitable site(s) on the project properties for the proposed development. This also identified unsuitable sites where environmental constraints prohibit development activities. Sensitivity maps were developed from each of the following specialist studies: Vertebrate Assessment, Vegetation Assessment, Wetland Assessment (updated), Phase 1 Heritage Impact Assessment and a Palaeontological Impact Assessment: Desktop study. The maps were then integrated into combined sensitivity maps, as given in the figures below. The maps were used to identify sensitive areas that should be avoided and protected as part of the proposed development, or where further mitigation measures would be required to address specific impacts that could not be avoided.

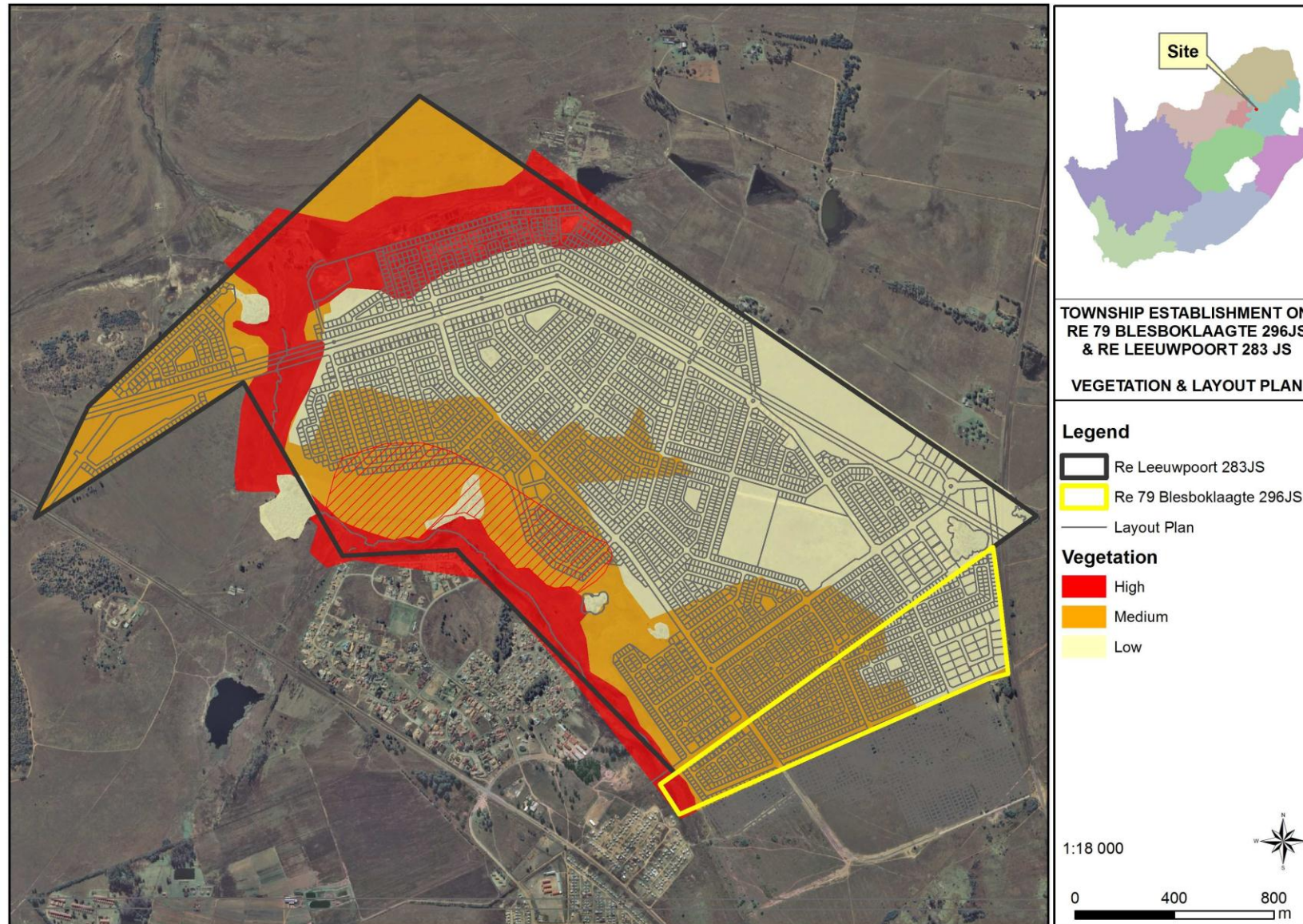


Figure 2: Ecological sensitivity map

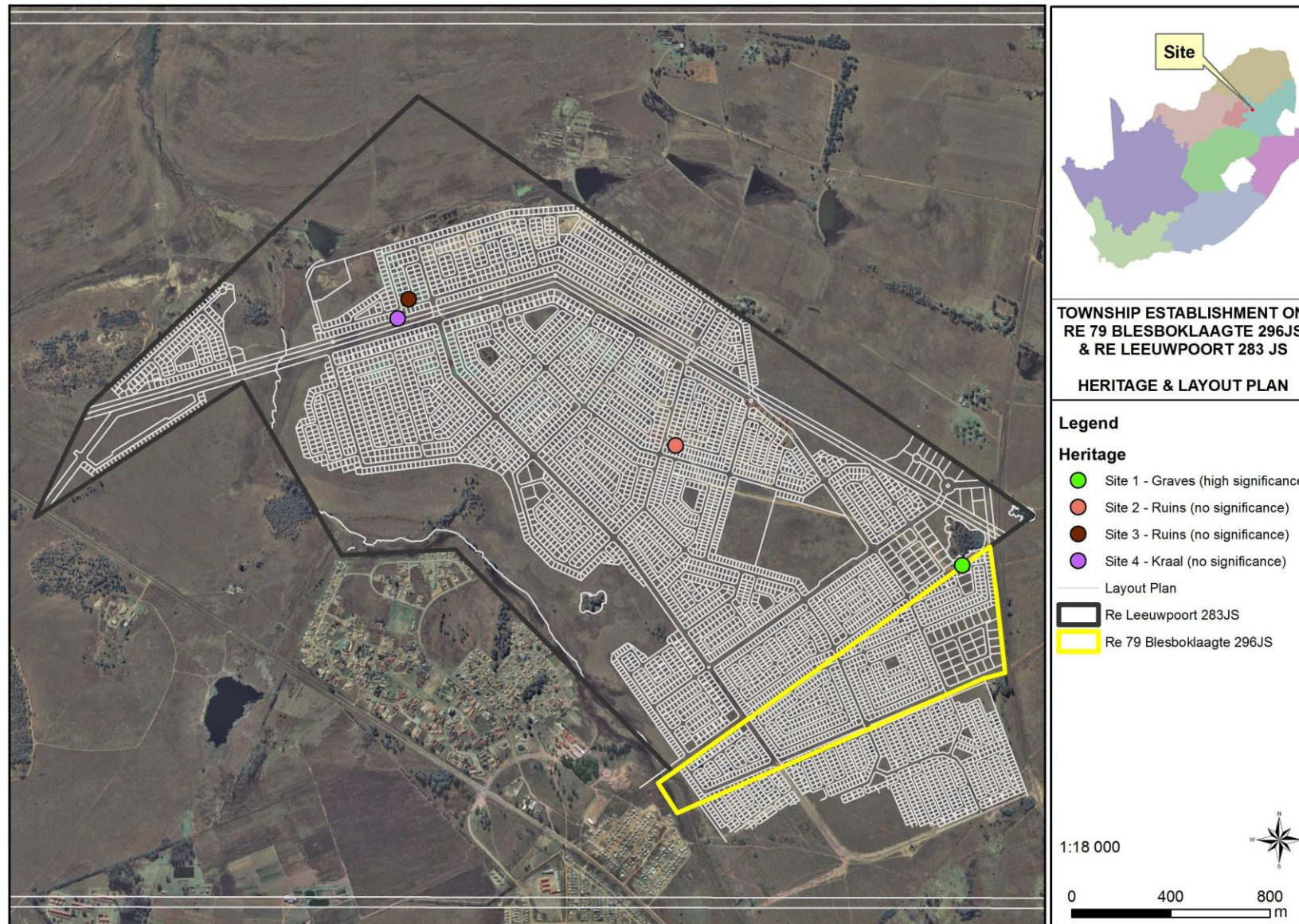


Figure 3: Heritage and Palaeontological sensitivity map

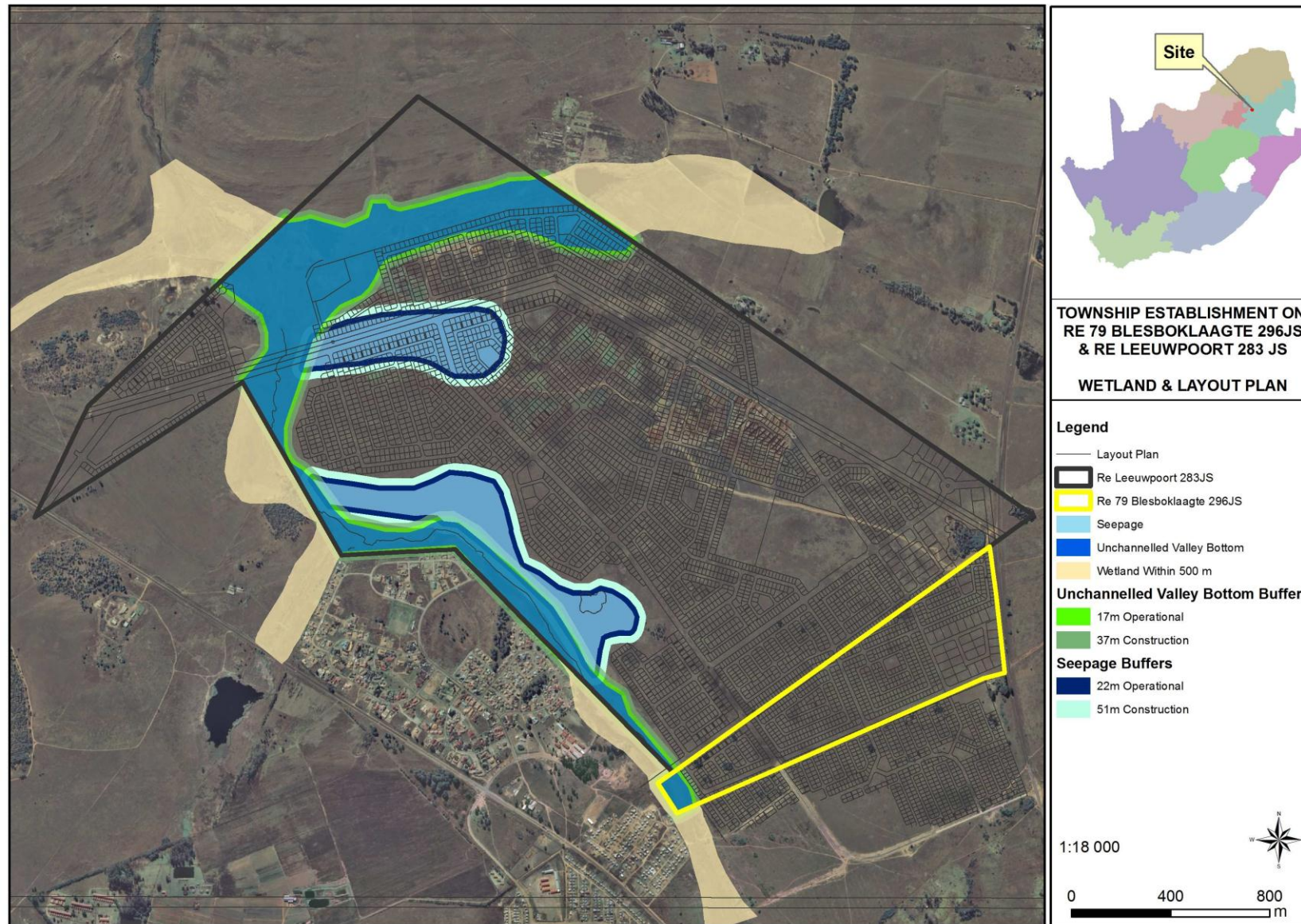


Figure 4: Wetland sensitivity map

8.1.2 Design/Layout

The layout plan for the proposed development was influenced by the following factors:

- Providing access to the proposed township area from the adjacent existing Pine Ridge Township, as well as the provincial district road on the eastern side of the development;
- The 1:100 year flood line was determined and the layout of the development plan accommodated this, restricting development to the area outside of the 1:100 year flood line – reserving a buffer area of 20m between the 1:100 year flood line and the residential area in Pine Ridge Extensions 1-4 and 50m between the 1:100 year flood line and the residential area in Pine Ridge Extensions 5-25;
- A Wetland delineation was also conducted, which greatly impacted the layout of the development;
- Major Eskom Servitude running through the development;
- Taking into consideration the access distance point to the provincial road of the proposed Pine Ridge Extensions as well as the newly proposed access point that had to be at least 650m from each other;
- Ensuring adequate surface storm water drainage;
- The layout plan makes provision for residential erven of a minimum of 300m² and an average of 327m²; and
- Adequate community facilities and educational erven had to be designed taking into account the number of residential erven.

8.1.3 Scale and Magnitude

In terms of scale and magnitude, two alternatives have been considered for the proposed development, as discussed below:

First alternative considered

As the two project properties are 506.8074ha in size, one alternative would have been to propose the development of the entire 506.8074ha for the proposed development. From a purely economic point of view, this alternative could have been promoted as it would have allowed a larger development to be constructed, which could have potentially resulted in higher economic returns for the developer. However, this approach would not have been in line with the requirement for sustainable development, as detailed in the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended. The NEMA, 1998, states that “sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of decisions to ensure that development serves present and future generations” (NEMA, 1998). Planning to develop the entire extent of the two properties would not have taken the environmental factors of the properties into account and this alternative has therefore been deemed to be unreasonable as it would have destroyed the more sensitive areas of the site in their entirety.

Second alternative considered

The second alternative in terms of scale and magnitude is the preferred alternative (the development option) where the environmental sensitivities have been taken into consideration and the layout plan amended according to the sensitivities. For Pine Ridge Extension 1 – 4 this included the following:

- The river and 1:100 year flood line was taken into consideration and a 20m buffer zone was incorporated between the 1:100 year floodline and the residential neighbourhood.

For Pine Ridge Extension 5 – 25 this included the following:

- The river and 1:100 year flood line was taken into consideration and a 50m buffer zone was incorporated between the 1:100 year floodline and the residential neighbourhood;
- The wetland delineation (2014) identified areas that need to be avoided and recommended a buffer zone of 32m from the edge of the wetland boundaries; and
- The grave site (containing at least 10 graves) was incorporated into a park in order to protect the graves.

The proposed layout plan takes into account the environmental attributes of the site, especially sensitive and more natural areas, such as wetland areas, and is therefore a layout that is in line with the requirement for sustainable development, as detailed in the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

The updated Wetland Assessment has identified wetland areas not previously identified onsite and buffer zones have been recommended by the wetland specialist. To maintain the functionality of the wetland, a Water Use Licence application will be followed and a management plan will be compiled for submission to the Department of Water and Sanitation, where development cannot be limited to areas outside of the wetland areas.

The Vegetation Assessment has recommended that areas with a High Vegetation Sensitivity (moist grasslands and the rocky ridge where a high frequency of plants of conservation concern occur) should not be developed and should be included as open spaces. The report further stated that if the open spaces cannot be adequately preserved, then the plants of conservation concern should be removed (where survival is possible) and relocated, after the necessary permits have been obtained. High sensitivity areas have been incorporated into open spaces in the layout plan, as far as possible and practical, and where this is not possible, relocation procedures will be followed.

8.1.4 “No-Go Option”

The No-Go Option would be where the project site is not developed and remains as vacant- and grazing- land. The No-Go Option is not considered to be a reasonable alternative as this would mean that the land is under-utilised in terms of its potential for a mixed use development and in particular, to reduce pressure on the Municipality in terms of the housing backlog. The project site is situated within areas earmarked as Urban Settlement Growth Areas and Strategic Development Areas according to the Emalahleni Spatial Development Framework and the No-Go option would therefore also not be in line with the spatial planning objectives of the municipality.

8.2 Public Participation Process undertaken in terms of Section 41 of the EIA Regulations, 2014

The following potentially Interested and Affected Parties were identified as part of the proposed development's Environmental Impact Assessment process:

- Mpumalanga Department of Agriculture, Rural Development and Land Administration
- Mpumalanga Department of Community Safety, Security and Liaison
- Mpumalanga Department of Public Works, Roads and Transport
- Nkangala District Municipality
- Emalahleni Local Municipality
- Emalahleni Local Municipality – Ward 12
- Emalahleni Local Municipality – Ward 15
- Department of Water and Sanitation – B11K
- Mpumalanga Department of Co-operative Governance and Traditional Affairs Land Use Management Department
- Mpumalanga Department of Co-operative Governance and Traditional Affairs Spatial Planning Department
- Mpumalanga Department of Health
- Mpumalanga Department of Social Development
- Mpumalanga Department of Human Settlements
- Mpumalanga Department of Education
- Mpumalanga Department of Education – Nkangala Region
- Mpumalanga Department of Finance

- Mpumalanga Department of Culture, Sport and Recreation
- South African Heritage Resources Agency (SAHRA)
- Department of Mineral Resources
- Department of Agriculture, Forestry and Fisheries
- South African National Road Agency Limited (SANRAL) Northern Region
- Adjacent land owner: Portion 197 of the farm Blesboklaagte 296 JS
- Adjacent land owner: Portion 152 (remaining extent) of the farm Blesboklaagte 296 JS
- Adjacent land owner: Portion 167 of the farm Blesboklaagte 296 JS
- Adjacent land owner Portion 218 of the farm Blesboklaagte 296 JS
- Adjacent land owner: Portion 13 of the farm Leeuwpoot 283 JS
- Adjacent land owner: Portion 76 of the farm Leeuwpoot 283 JS
- Adjacent land owner: Portion 75 of the farm Leeuwpoot 283 JS
- Adjacent land owner: Portion 11 of the farm Leeuwpoot 283 JS
- Adjacent land owner: Portion 84 of the farm Leeuwpoot 283 JS
- Adjacent land owner: Erf 1216 Witbank Extension 8, 1034
- Adjacent land owner: Portion 7 of the farm Leeuwpoot 283 JS
- Adjacent land owner: Portion 26 of the farm Leeuwpoot 283 JS
- Adjacent land owner: Portion 1 of the farm Bloekompos 414 JS
- Adjacent land owner: The Farm Tweedam 377 JS
- Adjacent land owner: Leeuwpoot 283 JS
- Adjacent land owner: Portions 1, 7, 13, 14 Klippoort 277
- Adjacent land owner: Portion 15 of the farm Leeuwpoot 283 JS
- Adjacent land owner: Portion 1 of the farm Leeuwpoot 283 JS & Portion 0 of the farm Tweedam 377 JS

For the initial Public Participation Process (notification of potentially Interested and Affected Parties), written notifications and Background Information Documents were distributed to the above mentioned list of identified Interested and Affected Parties. The notifications were sent via email, fax or registered post. Site notices were placed on the boundary of the project properties. A newspaper advertisement was placed in the Witbank News on the 27 of July 2018.

Proof of the above mentioned initial Public Participation Process is attached under Appendix C.

8.2.1 Public Review of the Draft Scoping Report

As required by the Environmental Impact Assessment Regulations, 2014, the Scoping Report (draft) was circulated for public review and commenting, for a period of at least 30 days. The review period was from the 24th of May 2019 to the 27th of June 2019. Interested and Affected Parties were notified of the availability of the Scoping Report and the review period via email, courier, hand delivery and/or registered post. Proof hereof is attached under Appendix C. Comments received from Interested and Affected Parties during this review period have been included in *Table 10* below.

8.2.2 Summary of the issues raised by the Interested and Affected Parties and how the issues were addressed or incorporated into the Environmental Impact Assessment process

Comments received from Interested and Affected Parties are summarised in the following table:

Table 10: Comments and Responses Report

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
Jacobus Frederick van Dyk	Marais Basson Inc.	6-09-2018	Email	<p>RE: JACOBUS FREDERICK VAN DYK</p> <p>Your email dated the 6th of August 2018 to our client refers.</p> <p>1. We are acting on behalf of Mr. van Dyk and have been instructed to address this letter to you.</p> <p>2. It is our instructions that Mr van Dyk is worried about the following:</p> <p>2.1 Our client's land mainly consists of wetland and he is worried about the sanitation.</p> <p>2.2 Secondly our client requests and undertaking that a wall must be erected between his property and the development. Our client is making use of a servitude road and his request is that the servitude road be protected.</p> <p>2.3 Please see our clients objections as per the attached annexure.</p> <p>2.4 We would like to hear from you.</p>	<p>EAP's response:</p> <p>Comments noted.</p> <p>Adequate sanitation infrastructure will be provided for the proposed development. Mitigation measures will also be recommended for implementation to ensure that potential spillages from sanitation infrastructure will be minimised and mitigated.</p> <p>It is not known at this stage what kind of wall/fence will be constructed around the proposed development.</p> <p>Further response from EAP:</p> <p>It is proposed that sewage from the proposed development will be treated in the municipal sewage treatment works.</p> <p>A permanent fence will be erected around the proposed development. The fence will be a concrete palisade fence or something similar to such a</p>

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
Sobandla Projects PTY LTD	Nomsombuluko Mdluli (Winne Mdluli)	13-08-2018	Email	<p>We: Sobandla Projects PTY LTD hereby wish to request registration forms as per above mentioned subject as advertised on Witbank new for the projects Pine Ridge.</p> <p>We are a new company seeking to supply services in construction & building material, flood/street lights and we are also in partnership with a company that purifies sea water to be usable.</p> <p>Kindly please let us know if there's any documents that you need from us and we will gladly submit</p>	<p>fence.</p> <p>EAP's response:</p> <ol style="list-style-type: none"> 1. The Interested and Affected Party Registration Form was sent to Sobandla Projects PTY LTD. 2. Labesh is only involved in the Environmental Impact Assessment process and not with the procurement of contractors for construction activities.
Nokukhanya Khumalo	South African Heritage Resources Agency (SAHRA)	14-08-2018	SAHRIS website	<p>Interim Comment In terms of Section 38(8), 38(4) of the National Heritage Resources Act (Act 25 of 1999)</p> <p>Attention: Sarovic Investments CC</p> <p>Township Establishment on the Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS and Portion 0 (remaining extent) of the farm Leeuwpoort 283 JS, Mpumalanga</p> <p>Sarovic Investments cc is proposing to construct a new township development located in Emalahleni Local Municipality of Mpumalanga Province. The</p>	<p>The Phase 1 Heritage Impact Assessment and Palaeontological Impact Assessment: Desktop studies have been loaded onto SAHRIS for review and commenting by SAHRA. SAHRA has issued Final Comments in response to the submitted reports.</p>

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>township development will consist of four phases of construction that all include mixed density residential development, commercial units, business parks, government avenues, roads, sewerage, electricity and water pipelines. Labesh Environmental Consulting (Pty) Ltd is undertaking an Environmental Impact Assessment (EIA) process on behalf of Sarovic Investments cc, in respect of listed activities in the National Environmental Management Act, 1998 (NEMA), NEMA Environmental Impact Assessment (EIA) Regulations 2017, and a Water Use License in terms of the Water Use Licence Regulations, March 2017 in terms of the National Water Act, 36 of 1998. A BID document has been submitted to SAHRA in terms of section 38(8) of the National Heritage Resources Act, 25 of 1999 for commenting. In terms of the National Heritage Resources Act, no 25 of 1999 (NHRA), heritage resources, including archaeological or palaeontological sites over 100 years old, graves older than 60 years, structures older than 60 years are generally protected. They may not be disturbed without a permit from the relevant heritage resources authority. In contexts of development applications, the developer must ensure that no heritage resources will be impacted by the proposed development, by lodging an</p>	

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>application to SAHRA and submitting detailed development specifications as a notification of intent to develop. If the application is made in terms of s. 38 (8) of the NHRA then it is incumbent on the developer to ensure that a Heritage Impact Assessment (HIA) is undertaken, as s. 38(2)a does not apply. Such a study should follow the SAHRA 2007 impact assessment guidelines and section 38(3). Any earth moving activities pose a threat to palaeontological and heritage resources, particularly in relatively undisturbed areas and in areas of Very High Palaeontological Sensitivity such as coal mines. Although the proposed development is located within an urban area the development may still impact on heritage resources, particularly as it is located close to stream which may have exposed fossiliferous rocks which must be assessed by a suitably qualified palaeontologist. Therefore, SAHRA requires a Palaeontological Impact Assessment undertaken by a suitably qualified palaeontologist, along with a HIA because the area is underlain by moderately sensitive palaeontological rocks.</p> <p>SAHRA APM unit will process the case further once the above requested reports are submitted to the case.</p>	

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				Should you have any further queries, please contact the designated official using the case number quoted above in the case header.	
Land Use Administration: Department of Agriculture, Forestry and Fisheries	Mabule Ramodike	31-08-2018	Email	Comments were illegible.	<p>Good day Mr Ramodike</p> <p>I hereby acknowledge receipt of your email, your completed Interested and Affected Party Registration Form and your comments for the following proposed project: Township Establishment on the Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS and Portion 0 (remaining extent) of the farm Leeuwpoot 283 JS, Mpumalanga</p> <p>I furthermore confirm that you have been added to the Interested and Affected Party Register for this project, and that you will be notified of future public participation opportunities.</p> <p>Could you kindly please submit your comments, included your attached Interested and Affected Party Registration Form, in an email (typed) as we can unfortunately not clearly</p>

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
					read the comments. Thank you in advance.
None (Private interest)	Mr. Frik van Dyk	04-09-2018	Email	<p>Eerstens is ek bekommerd oor waar die sanitasie-aanleg gaan wees omdat ons 'n vleiland op ons eiendom het en dat ons water besoedel sal word.</p> <p>Tweedens versoek ek dat daar 'n behoorlike beton-heining opgerig word op die grens van die area wat ontwikkel gaan word en die serwitiet-pad wat na my eiendom toegang verleen. My woonhuis is ±30 meter van die grens van hierdie serwitiet-pad.</p> <p>As eienaar is ek bekommerd oor die impak wat die ontwikkeling op die onmiddellike omgewing sal hê asook die veiligheid van mens en dier.</p> <p>Met dank.</p> <p>Translation into English Firstly, I'm worried about where the sanitation plant will be because we have a wetland on our property and that our water will be polluted.</p> <p>Secondly, I request that a proper concrete fence be erected on the border of the area to be developed and the servitude road that gives</p>	<p>Good day Mr van Dyk</p> <p>I hereby acknowledge receipt of your email, your completed Interested and Affected Party Registration Form and your comments for the following proposed project: Township Establishment on the Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS and Portion 0 (remaining extent) of the farm Leeuwpoort 283 JS, Mpumalanga.</p> <p>I furthermore confirm that you have been added to the Interested and Affected Party Register for this project, and that you will be notified of future public participation opportunities. Your comments will be responded to in the reports that will in due course be compiled and provided to you for review and commenting.</p> <p>Could you please provide us with Boris Benic and Charles Deiner's</p>

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>access to my property. My home is \pm 30 meters from the boundary of this servitude road.</p> <p>As an owner, I am concerned about the impact the development will have on the immediate environment as well as the safety of humans and animals.</p> <p>With thanks.</p>	<p>contact details so that we can ensure that they are also informed of this proposed project?</p> <p>Further response from EAP: Adequate sanitation infrastructure will be provided for the proposed development. Mitigation measures will also be recommended for implementation to ensure that potential spillages from sanitation infrastructure will be minimised and mitigated.</p> <p>It is not known at this stage what kind of wall/fence will be constructed around the proposed development.</p> <p>Further response from EAP: It is proposed that sewage from the proposed development will be treated in the municipal sewage treatment works.</p> <p>A permanent fence will be erected around the proposed development. The fence will be a concrete palisade fence or something similar to such a</p>

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
South African Heritage Resources Agency (SAHRA)	Nokukhanya Khumalo	24-04-2019	SAHRIS website	<p>CaseID: 12766 Interim Comment In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999)</p> <p>Attention: Sarovic Investments CC</p> <p>Township Establishment on the Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS and Portion 0 (remaining extent) of the farm Leeuwpoort 283 JS, Mpumalanga.</p> <p>Sarovic Investments cc is proposing to construct a new township development located in Emalahleni Local Municipality of Mpumalanga Province. The township development will consist of four phases of construction that all include mixed density residential development, commercial units, business parks, government avenues, roads, sewerage, electricity and water pipelines.</p> <p>Labesh Environmental Consulting (Pty) Ltd is undertaking an Environmental Impact Assessment (EIA) application process on behalf of Sarovic Investments cc, in respect of listed activities in the National Environmental Management Act, 1998 (NEMA), NEMA Environmental Impact</p>	<p>fence.</p> <p>Comments noted. The draft Scoping Report and annexures, including the Town Planning reports and proposed layout plan, were submitted to the South African Heritage Resources Agency via the SAHRIS website for review and commenting.</p>

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>Assessment (EIA) Regulations 2017, and a Water Use License in terms of the Water Use Licence Regulations, March 2017 in terms of the National Water Act, 36 of 1998. A BID document was been submitted to SAHRA in terms of section 38(8) of the National Heritage Resources Act, 25 of 1999 for commenting. An Interim Comment was issued on 14/08/2018, requesting that a Heritage Impact Assessment and a Palaeontological Impact Assessment is undertaken as part of the specialist studies in the EIA application. Both these reports have been submitted to the case for commenting.</p> <p>Fourie, H. June 2015. The establishment of a mixed residential township, Sarovic Investments eMalahleni Local Municipality, Mpumalanga Province Farm: Remaining extent of Portion 79 Blesboklaagte 296 JS and Portion 0 (remaining extent) Leeuwpoort 283 JS. Palaeontological Impact Assessment: Desktop Study.</p> <p>The study area is underlain by Late Carboniferous to Early Permian clastic rocks, varved shale, conglomerates and pebbly sandstone of the Dwyka Group, Karoo Supergroup. These rocks are of moderate palaeontological sensitivity, the author recommends that any exposure of Dwyka rocks be examined by palaeontologist. It is also</p>	

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>underlain by conglomerates, reddish sandstone rocks of the Wilgerivier Formation, Waterberg Group, Transvaal Supergroup. Fossils have not been recorded within this formation. The potential impact on fossil heritage is considered low and the author does not recommend a field survey and no further mitigation measures.</p> <p>Pelser, A. May 2014. A Phase 1 HIA Report for a Proposed Township Development on the Remainder of the Farm Leeupoort283JS & Ptn 79 of Blesboklaagte 296JS, eMalahleni, Mpumalanga.</p> <p>The author undertook a field survey of the proposed development and identified 4 heritage sites. Site 1 is an unfenced cemetery containing 10 graves, it is considered to be of high local significance. Sites 2-4 are 3 historical remains consisting of 2 house foundations, and a livestock enclosure. They are all low local significance.</p> <p>The author recommends that the grave site is fenced and incorporated into the planned township development.</p> <p>Interim Comment</p> <p>It is noted that this case is a re-application of a</p>	

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>case created on SAHRIS in 2015 (Case ID 7557), whereby SAHRA approved the development. However, the environmental consulting company has changed, and only the Background Information Document has been submitted to SAHRA, it is not clear if there are changes to the scope of the project. Therefore, all environmental documents and the finalised town plan must be submitted to the case for commenting.</p> <p>The South African Heritage Resources Agency (SAHRA) Archaeology, Palaeontology and Meteorites (APM) Unit requires the environmental documents to be submitted to the case before commenting further on the development application.</p> <p>Should you have any further queries, please contact the designated official using the case number quoted above in the case header.</p>	
South African Heritage Resources Agency (SAHRA)	Nokukhanya Khumalo	10-06-2019	SAHRIS website	<p>CaseID: 12766</p> <p>Final Comment</p> <p>In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999)</p> <p>Attention: Sarovic Investments CC</p> <p>Township Establishment on the Remaining</p>	<p>Comments noted and the requirements will be attended to.</p> <p>The Final Comments from SAHRA have been submitted to the Competent Authority (the Mpumalanga Department of Agriculture, Rural Development, Land</p>

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>Extent of Portion 79 of the farm Blesboklaagte 296 JS and Portion 0 (remaining extent) of the farm Leeuwpoort 283 JS, Mpumalanga</p> <p>Sarovic Investments cc is proposing to construct a new township development located in Emalahleni Local Municipality of Mpumalanga Province. The township development will consist of four phases of construction that all include mixed density residential development, commercial units, business parks, government avenues, roads, sewerage, electricity and water pipelines.</p> <p>Labesh Environmental Consulting (Pty) Ltd is undertaking an Environmental Impact Assessment (EIA) application process on behalf of Sarovic Investments cc, in respect of listed activities in the National Environmental Management Act, 1998 (NEMA), NEMA Environmental Impact Assessment (EIA) Regulations 2017, and a Water Use License in terms of the Water Use Licence Regulations, March 2017 in terms of the National Water Act, 36 of 1998. A BID document was been submitted to SAHRA in terms of section 38(8) of the National Heritage Resources Act, 25 of 1999 for commenting.</p> <p>An Interim Comment was issued on 14/08/2018,</p>	<p>and Environmental Affairs), as required, and proof thereof has been uploaded to the specific case for this project on the SAHRIS website. The proof has also been provided under Appendix E of this report.</p>

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>requesting that a Heritage Impact Assessment and a Palaeontological Impact Assessment is undertaken as part of the specialist studies in the EIA application. Another Interim Comment was issued on 24/04/2019, once the specialist studies were uploaded to the case. SAHRA stated that they await the submission of the finalised town plan and the Environmental reports and its appendices before commenting on the case. A Scoping Report has been submitted the case along with its appendices and SAHRA has reviewed the heritage in put into the report.</p> <p>Final Comment The SAHRA Archaeology, Palaeontology, and Meteorites Unit accepts the recommendations provided in the PIA and Heritage Impact Assessment. Upon analysis of the finalised township plan, site 1 can be retained in situ with a fence around the graves. This must be included in the mitigation measures in the EMPr and EIA reports.</p> <p>A comment in terms of section 34 of the NHRA, for sites 2-4, must be sort from the Mpumalanga Heritage Resources Authority (MPHRA). Please contact Benjamin Moduka at bmoduka@mpg.gov.za or call the offices at 013</p>	

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>766 5196.</p> <p>The Burial Grounds and Graves (BGG) Unit accepts the recommendations for the burial grounds identified in the HIA report and further recommends that Site 1 must be fenced with an access gate. Before fencing may occur, permission from the family members must be sort. This must be done by undertaking a social consultation process to identify the family members of the site. This must be done in terms of Chapter IX of the NHRA Regulations and section 36(3) of the NHRA.</p> <p>The following conditions must be included in the EMPr report:</p> <p>In the event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected.</p> <p>If there are any new heritages resources are discovered during construction and operation</p>	

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the developer.</p> <p>If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer. Mitigation will only be carried out after the archaeologist or palaeontologist obtains a permit in terms of section 35 of the NHRA (Act 25 of 1999). You may contact SAHRA APM Unit for further details: (Nokukhanya Khumalo/Phillip Hine 021 202 8654).</p> <p>If any unmarked human burials are uncovered and the archaeologist called in to inspect the finds and/or the police find them to be heritage graves, then mitigation may be necessary and the SAHRA Burial Grounds and Graves (BGG) Unit must be contacted for processes to follow (Thingahangwi Tshivase/Mimi Seetelo 072 802 1251).</p> <p>The EIA report and its appendices must be submitted to the case for record purposes and once a Record of Decision from the competent</p>	

Entity represented	Name and Surname	Date upon which comment was received	Comment submitted via	Comment(s) raised	Response to comment(s) raised
				<p>authority is issued, it must also be submitted to the case.</p> <p>This comment must be forwarded to the competent authority and proof of submission must be uploaded to the case.</p> <p>Should you have any further queries, please contact the designated official using the case number quoted above in the case header.</p>	

8.3 Environmental attributes associated with the alternatives considered – Environmental attributes of the proposed, project properties (the preferred alternative)

8.3.1 Geographical

Geology

A Phase 1 Geotechnical Investigation (Engineering Geological Investigation) was conducted for the project site by GEOSSET CC in May 2014. The full report is attached under Appendix D.

The northern portion of the site is underlain by shale and tillite of the Dwyka Formation, Karoo Supergroup, as well as sandstone, quartzitic sandstone and conglomerate of the Wilge River Formation, Waterberg Group, towards the Blesbokspruit River.

The bedrock is covered by transported material, termed “hillwash”, in the test pit profiles. No dolomite occurs in the area, and as such no dolomite stability investigation was required.

Drainage takes place through sheet wash and a drainage channel is present on the site. Drainage occurs in a south-westerly direction towards the Blesbok Spruit, a tributary to the Olifants River. The permanent water table on site is not deeper than 1,5m below natural ground surface as it was encountered in some test pits. A perched water table exist on shallow bedrock with low permeability characteristics of the rock mass and during long periods of consistent rain, a rise of the water table can be expected.

Evaluation of the site for urban development

- Strong seepage and the presence of perennial fluctuations of ground water were encountered on site and a seasonal perched water table exists on top of the bedrock or within the pedogenetic layer comprising nodular ferricrete and the pebble marker. The elevated water table can possibly also be linked to the numerous small dams from the quarries on the higher lying areas, as they were filled with rain water after a period of high rainfall that preceded the field survey. This water possibly drained along the slopes and saturated some of the colluvium and water flow was also encountered on and along the bedrock.
- The installation of a proper drainage system is recommended to keep the moisture down and to drain excess water after periods of high rainfall.
- Special care must be taken to ensure adequate surface drainage to prevent the accumulation of water next to structures.
- The site contains low and low to medium expansive soil, together with a medium compressible and a highly collapse potential. Foundations will need special precautionary measures to minimise soil movement associated with a variation in moisture content of the soil.
- Some severe problems regarding excavatability can be expected in Zone PR towards the drainage of the Blesbokspruit.
- Retaining walls as well as slope stabilisation measures are recommended on all constructed embankments exceeding 1,5m as unstable pit walls were encountered.
- Storm water control measures such as ponding pools are recommended to control peak flows during thunderstorms. All embankments must be adequately compacted and vegetated with grass to limit any excessive erosion and scouring of the landscape.
- Some mining activities on site or historic mining or contaminated land in the area were observed on site as there are gravel quarries located on site where gravel and sand are currently mined.
- The site is located far from any other mining activities and in an inactive area regarding seismic activity.

- Due to the level of development adjacent to this area, the likelihood for the development of more borrow pits on site is not advised.
- All road building and construction materials should be sourced from established commercial activities in and around Witbank.
- Residential developments are possible on the site with the recommended precautionary measures. Difficult excavation of service and foundation construction is anticipated (GEOSET CC, 2014).

Soil

A Soil, Land Capability and Land Use assessment was conducted by Rehab Green Monitoring Consultants CC (2014). The full report is attached under appendix D.

Soil types within the proposed Development Area

A total of 17 homogeneous soil units, based on dominant soil form, effective soil depth, internal drainage, terrain unit and slope percentage were identified during field observations and were symbolised as: Hu1, Hu2, Hu3, Gc1, Cv1, Cv2, Cv3, Cv4, Cv5, Gc2, Ms/R, Wa, Cf, Fw-D and Wb1. Two non-soil related units were identified and symbolised as Exc1 and Exc2 which consist of excavated and partly excavated areas. The homogeneous units are referred to as soil types and are shown in *Figure 5* below.

Soil types within the Soil Study Area

A total of 19 homogeneous soil units, based on dominant soil form, effective soil depth, internal drainage, terrain unit and slope percentage were identified during field observations and were symbolised as: Hu1, Hu2, Hu3, Gc1, Cv1, Cv2, Cv3, Cv4, Cv5, Gc2, Ms/R, Wa, Cf, Fw, Fw-D, Kd and Wb1. Two non-soil related units were identified and symbolised as Exc1 and Exc2. These consist of excavated and partly excavated areas. The soil types are shown in *Figure 6* below. The figure also contains an abbreviated soil legend.

Agricultural Potential

A Soil, Land Capability and Land Use assessment was conducted by Rehab Green Monitoring Consultants CC (2014). The full report is attached under appendix D.

Land capability of the proposed Development Area

Approximately 29.71% (103.46 ha) of the proposed Development Area is dominated by soils with **arable land capability**, consisting of red and brownish yellow, apedal, loamy sand to sandy loam soils. These arable soils are dominated by Hutton, Glencoe and Clovelly soil forms, symbolized as soil types Hu1, Hu2, Hu3, Gc1, Cv1, Cv2 and Cv3.

Approximately 51.36% (178.98 ha) of the proposed Development Area is dominated by soils with **grazing land capability** consisting of shallow brownish yellow, apedal, loamy sand soils and shallow rocky/stony soils. These soils are dominated by Clovelly, Glencoe and Mispah soil forms, symbolized as soil types Cv4, Cv5, Gc2 and Ms/R.

Approximately 3.95% (13.79 ha) of the proposed Development Area was classed as **wetland** consisting of grey, imperfectly to poorly drained sandy soils. These soils are dominated by Wasbank, Cartref and Fernwood soil forms, symbolized as soil types Wa, Cf and Fw-D. The large section of soil type Fw-D is excavated to some extent or mechanically disturbed by previous sand mining activities.

Approximately 14.98% (52.19 ha) of the proposed Development Area consists of areas classed as **wilderness land**. Unit Wb1 consists of a previously excavated site that appears to be rehabilitated to some extent. Unit Exc1 consists of a site where soil are currently excavated, but is also backfilled simultaneously at some sections. Unit Exc2 consists of an

excavated site where sand is currently mined. A land capability map for the proposed development area is given as *Figure 7*.

Land capability of the Soil Study Area

Approximately 24.53% (124.4 ha) of the Soil Study Area is dominated by soils with **arable land capability**, consisting of red and brownish yellow, apedal, loamy sand to sandy loam soils. These arable soils are dominated by Hutton, Glencoe and Clovelly soil forms.

Approximately 50.89% (258.06 ha) of the Soil Study Area is dominated by soils with **grazing land capability** consisting of very shallow to shallow brownish yellow, apedal, loamy sand soils with scattered surface stones as well as areas dominated by exposed rock and stones. These soils are dominated by Clovelly, Glencoe and Mispah soil forms.

Approximately 13.52% (68.56 ha) of the Soil Study Area was classed as **wetland**, consisting of grey, imperfectly to poorly drained sandy soils. These soils are dominated by Wasbank, Cartref, Fernwood and Kroonstad soil forms, symbolized as soil types Wa, Cf, Fw, Fw-D and Kd.

Approximately 11.08% (56.17 ha) of the Soil Study Area consists of areas classed as **wilderness land**. Unit Wb1 consists of a previously excavated site that appears to be rehabilitated to some extent. Unit Exc1 consists of a site where soil are currently excavated, but are also backfilled simultaneously at some sections. Unit Exc2 consists of excavated sites where sand is currently mined as well as a former road quarry. A land capability map for the proposed development area is given below (*Figure 8*).

Pre-mining land use (proposed Development area)

The majority (80.19%) of the proposed Development Area is utilized for grazing purposes from time to time. A further 12.22% of an area that was previously mined/excavated is grazed simultaneously although the carrying capacity is probably very low. This translates to 92.4% of the Development Area that is currently utilized for grazing purposes. The other disturbed areas that have no grazing capacity consists of the current sand mining pit (1.37%), a former sand mining pit (0.01%) and the current quarry and landfill area (4.58%), which translates to a total of 5.96%. The remainder (1.64%) of the proposed Development Area is occupied by very small uses such as a dam, gravel road, tar road, cemetery and soccer field. A map showing the proposed development area is given as *Figure 9*.

Pre-mining land use (Soil Study Area)

The majority (83.55%) of the Soil Study Area is utilised for grazing purposes from time to time. A further 10.18% of an area that was previously mined/excavated is grazed simultaneously although the carrying capacity is probably very low. This translates to 93.73% of the Soil Study Area that is currently utilised for grazing purposes. The other disturbed areas that have no grazing capacity consist of the current sand mining pit (0.94%), a former sand mining pit (0.34%) and the current quarry and landfill area (3.15%) that translate to a total of 4.43% The remainder (1.84%) of the Soil Study Area is occupied by very small uses such as a dam, gravel road, tar road, cemetery and soccer field. A map showing the soil study area is given as *Figure 10*.

Figure 3a: Detailed soil map of the proposed Development Area

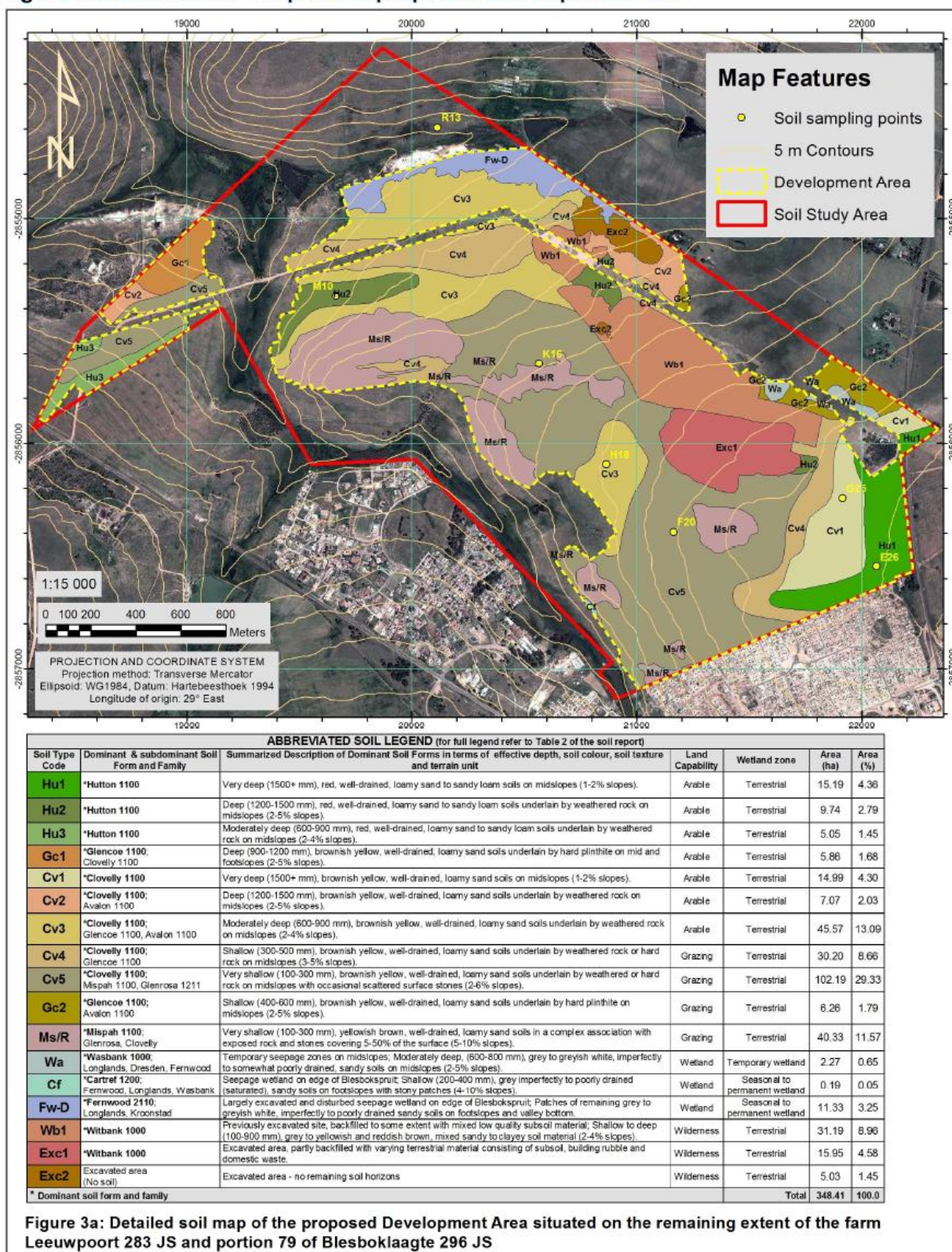
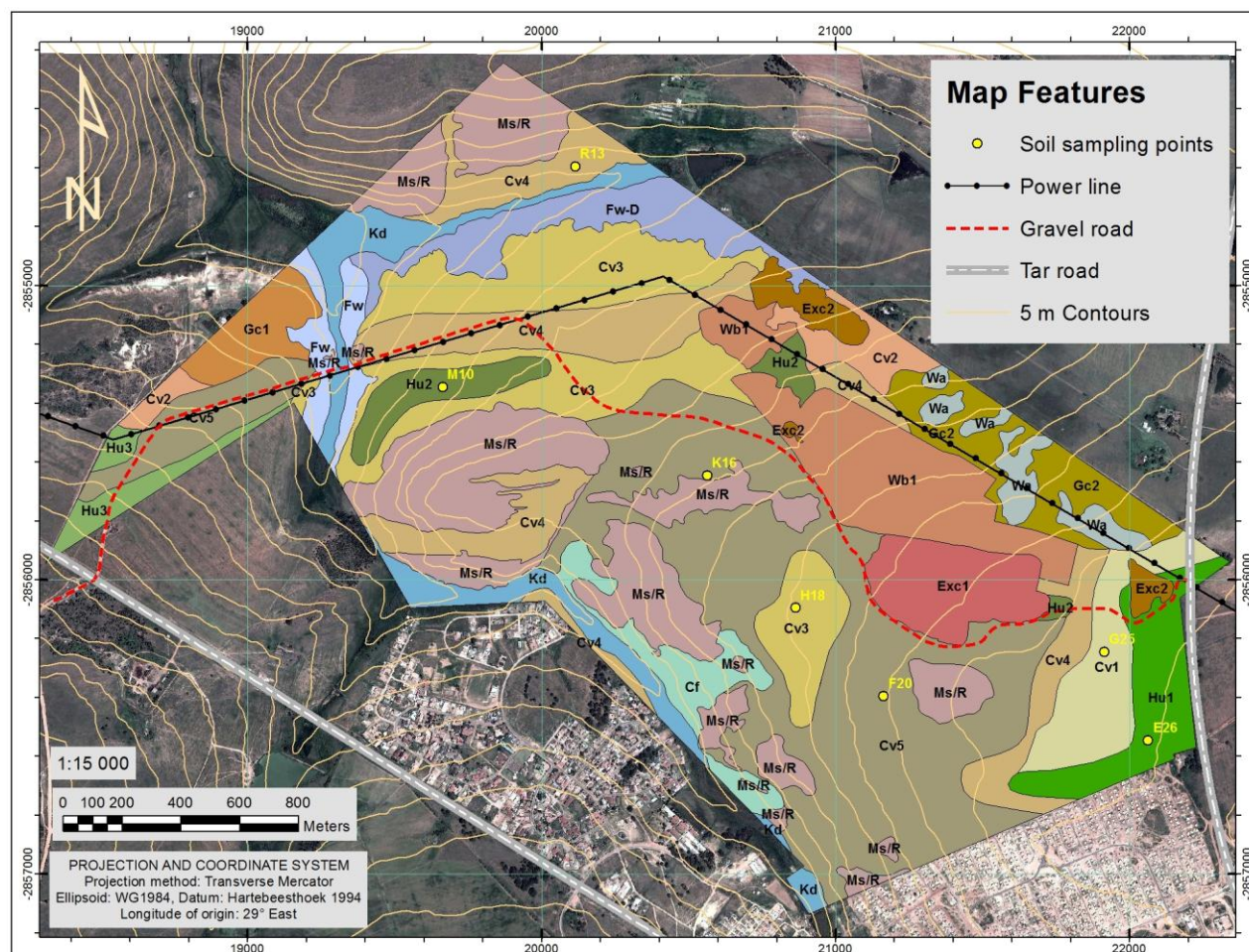


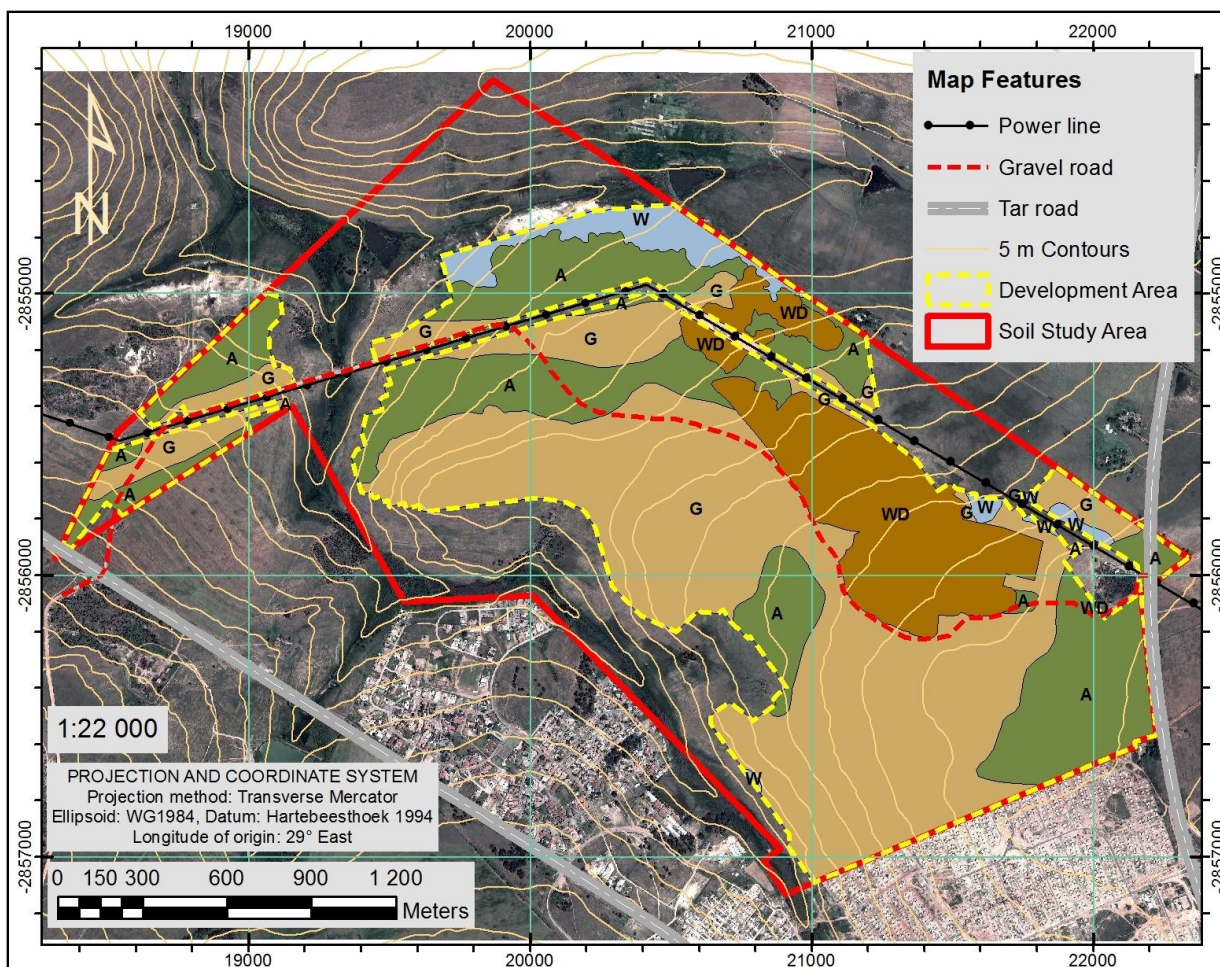
Figure 5: Detailed soil map of the proposed Development Area



ABBREVIATED SOIL LEGEND (for full legend refer to Table 2 of the soil report)						
Soil Type Code	Dominant & subdominant Soil Form and Family	Summarized Description of Dominant Soil Forms in terms of effective depth, soil colour, soil texture and terrain unit	Land Capability	Wetland zone	Area (ha)	Area (%)
Hu1	*Hutton 1100	Very deep (1500+ mm), red, well-drained, loamy sand to sandy loam soils on midslopes (1-2% slopes).	Arable	Terrestrial	16.11	3.18
Hu2	*Hutton 1100	Deep (1200-1500 mm), red, well-drained, loamy sand to sandy loam soils underlain by weathered rock on midslopes (2-5% slopes).	Arable	Terrestrial	11.29	2.23
Hu3	*Hutton 1100	Moderately deep (600-900 mm), red, well-drained, loamy sand to sandy loam soils underlain by weathered rock on midslopes (2-4% slopes).	Arable	Terrestrial	6.77	1.34
Gc1	*Glencoe 1100; Clovelly 1100	Deep (900-1200 mm), brownish yellow, well-drained, loamy sand soils underlain by hard plinthite on mid and footslopes (2-5% slopes).	Arable	Terrestrial	9.18	1.81
Cv1	*Clovelly 1100	Very deep (1500+ mm), brownish yellow, well-drained, loamy sand soils on midslopes (1-2% slopes).	Arable	Terrestrial	16.51	3.25
Cv2	*Clovelly 1100; Avalon 1100	Deep (1200-1500 mm), brownish yellow, well-drained, loamy sand soils underlain by weathered rock on midslopes (2-5% slopes).	Arable	Terrestrial	8.86	1.74
Cv3	*Clovelly 1100; Glencoe 1100, Avalon 1100	Moderately deep (600-900 mm), brownish yellow, well-drained, loamy sand soils underlain by weathered rock on midslopes (2-4% slopes).	Arable	Terrestrial	55.68	10.98
Cv4	*Clovelly 1100; Glencoe 1100	Shallow (300-500 mm), brownish yellow, well-drained, loamy sand soils underlain by weathered rock or hard rock on midslopes (3-5% slopes).	Grazing	Terrestrial	55.16	10.87
Cv5	*Clovelly 1100; Mispah 1100, Glenrosa 1211	Very shallow (100-300 mm), brownish yellow, well-drained, loamy sand soils underlain by weathered or hard rock on midslopes with occasional scattered surface stones (2-6% slopes).	Grazing	Terrestrial	113.59	22.39
Gc2	*Glencoe 1100; Avalon 1100	Shallow (400-600 mm), brownish yellow, well-drained, loamy sand soils underlain by hard plinthite on midslopes (2-5% slopes).	Grazing	Terrestrial	16.37	3.23
Ms/R	*Mispah 1100; Glenrosa, Clovelly	Very shallow (100-300 mm), yellowish brown, well-drained, loamy sand soils in a complex association with exposed rock and stones covering 5-50% of the surface (5-10% slopes).	Grazing	Terrestrial	72.94	14.40
Wa	*Wasbank 1000; Longlands, Dresden, Fernwood	Temporary seepage zones on midslopes; Moderately deep, (600-800 mm), grey to greyish white, imperfectly to somewhat poorly drained, sandy soils on midslopes (2-5% slopes).	Wetland	Temporary wetland	8.48	1.67
Cf	*Cartref 1200; Fernwood, Longlands, Wasbank	Seepage wetland on edge of Blesbokspuit; Shallow (200-400 mm), grey imperfectly to poorly drained (saturated), sandy soils on footslopes with stony patches (4-10% slopes).	Wetland	Seasonal to permanent wetland	11.47	2.26
Fw	*Fernwood 2110; Longlands, Kroonstad	Seepage wetland on edge of Blesbokspuit; Deep (1200+ mm), grey to greyish white, imperfectly to poorly drained, sandy soils on footslopes and valley bottom (2-5% slopes).	Wetland	Seasonal to permanent wetland	8.12	1.60
Fw-D	*Fernwood 2110; Longlands, Kroonstad	Largely excavated and disturbed seepage wetland on edge of Blesbokspuit; Patches of remaining grey to greyish white, imperfectly to poorly drained sandy soils on footslopes and valley bottom.	Wetland	Seasonal to permanent wetland	18.13	3.57
Kd	*Kroonstad 1000; Katspruit, Longlands, Fernwood	Wetland - saturated riverbed and edges of the Blesbokspuit; Shallow (400-600 mm), dark grey to greyish white, poorly drained, sandy to clay soils in valley bottoms (1-3% slopes).	Wetland	Permanent wetland	22.36	4.42
Wb1	*Witbank 1000	Previously excavated site, backfilled to some extent with mixed low quality subsoil material; Shallow to deep (100-900 mm), grey to yellowish and reddish brown, mixed sandy to clayey soil material (2-4% slopes).	Wilderness	Terrestrial	33.48	6.60
Exc1	*Witbank 1000	Excavated area, partly backfilled with varying terrestrial material consisting of subsoil, building rubble and domestic waste.	Wilderness	Terrestrial	15.95	3.15
Exc2	Excavated area (No soil)	Excavated area - no remaining soil horizons	Wilderness	Terrestrial	6.74	1.33
* Dominant soil form and family					Total	507.19 100.0

Figure 3b: Detailed soil map of the remaining extent of the farm Leeuwpoot 283 JS and portion 79 of Blesboklaagte 296 JS

Figure 6: Detailed soil map of the study site



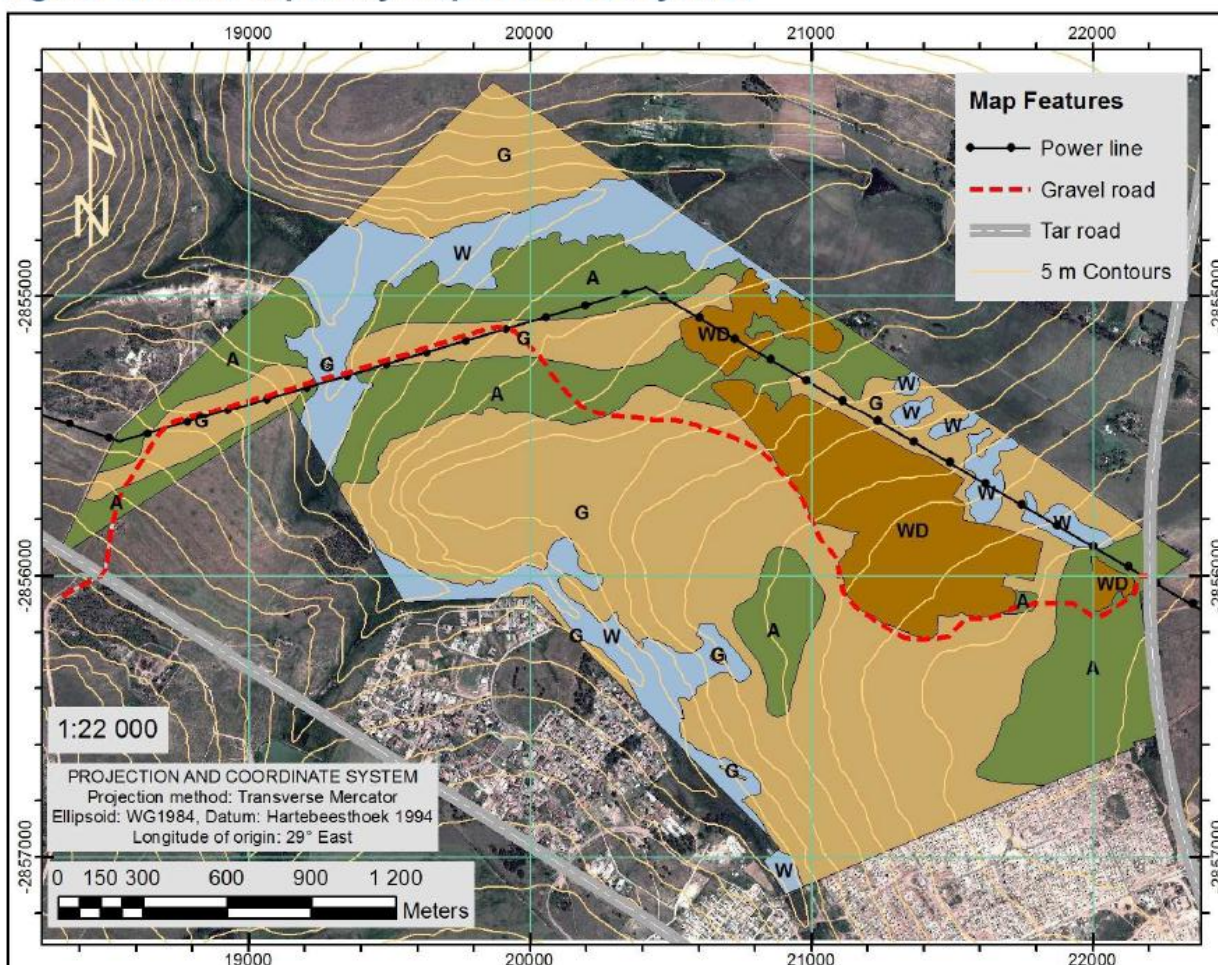
LEGEND: LAND CAPABILITY

Land Capability Code	Land Capability Class	*Soil Types	Broad Soil Description	Unit Count	Area (ha)	Area (%)
A	Arable	Hu1, Hu2, Hu3, Gc1, Cv1, Cv2, Cv3	Terrain: Gentle midslopes (1-5% slopes). Soil: Moderately deep to very deep (600-1500+ mm), red and brownish yellow, well-drained, loamy sand to sandy loam soils.	13	103.46	29.71
G	Grazing	Cv4, Cv5, Gc2, Ms/R	Terrain: Gentle to moderate midslopes (2-10% slopes). Soil: Very shallow to shallow (100-500 mm), brownish yellow, well-drained, loamy sand soils with scattered surface stones (Cv4, Cv5, Gc2) as well as areas dominated by exposed rock and stones (Ms/R).	11	178.98	51.36
W	Wetland	Wa, Cf, Fw-D	Terrain: Seepage zones (Wa, Cf) and disturbed seepage zones (Fw-D) on footslopes (2-10% slopes). Soil: Grey, imperfectly to poorly drained, sandy soils.	7	13.79	3.95
WD	Wilderness	Wb1, Exc1, Exc2	Terrain: Excavated areas (Exc1, Exc2) and rehabilitated excavated areas (Wb1) on gentle midslopes. Soil: No remaining natural soil horizons.	4	52.19	14.98
*See soil map, Figure 3a				Total	35	348.42
					100.0	

Figure 4a: Land capability map of the proposed Development Area situated on the remaining extent of the farm Leeuwpoot 283 JS and portion 79 of the farm Blesboklaagte 296 JS

Figure 7: Land Capability Map of the proposed development area

Figure 4b: Land capability map of Soil Study Area



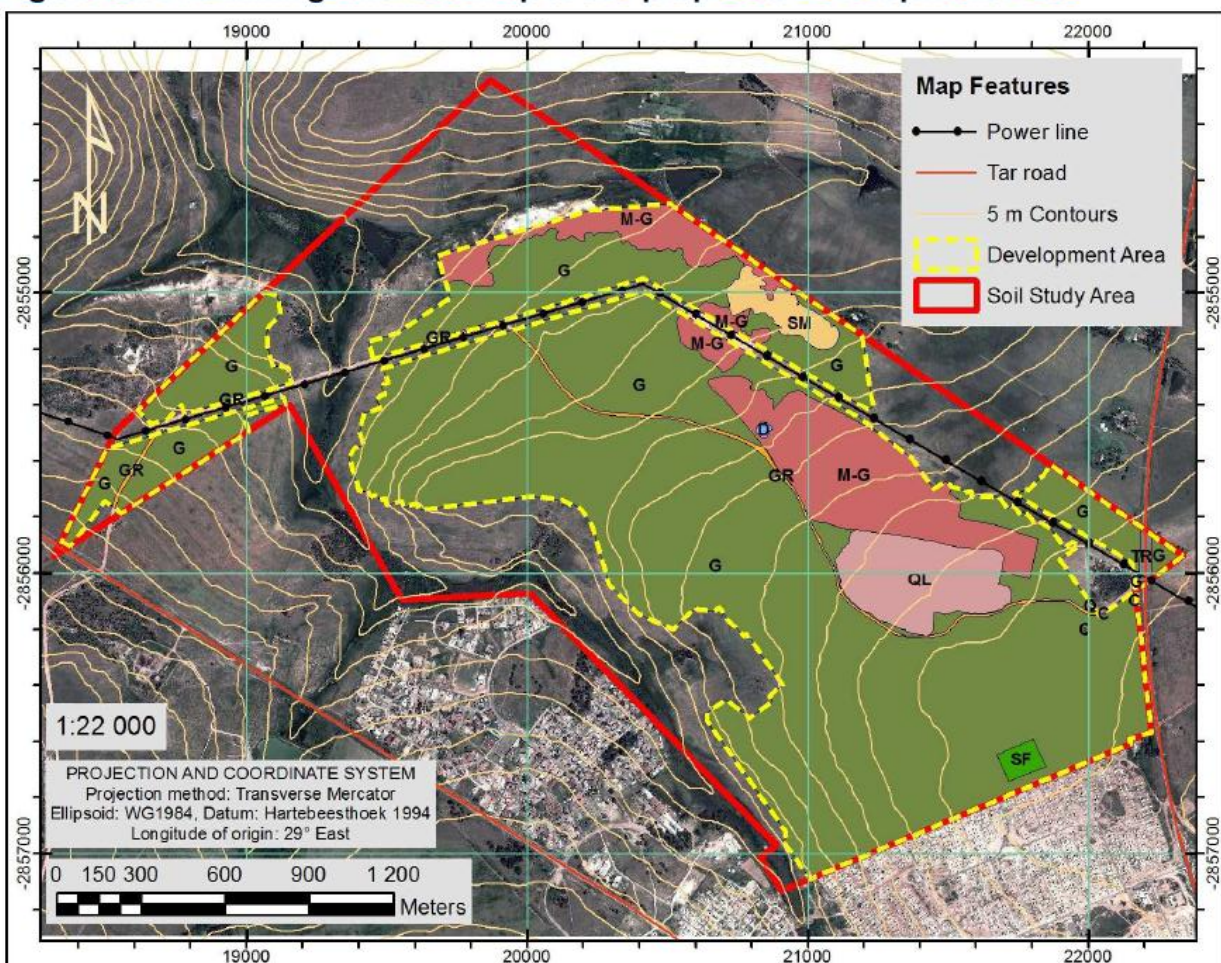
LEGEND: LAND CAPABILITY

Land Capability Code	Land Capability Class	*Soil Types	Broad Soil Description	Unit Count	Area (ha)	Area (%)
A	Arable	Hu1, Hu2, Hu3, Gc1, Cv1, Cv2, Cv3	Terrain: Gentle midslopes (1-5% slopes). Soil: Moderately deep to very deep (600-1500+ mm), red and brownish yellow, well-drained, loamy sand to sandy loam soils.	7	124.4	24.53
G	Grazing	Cv4, Cv5, Gc2, Ms/R	Terrain: Gentle to moderate midslopes (2-10% slopes). Soil: Very shallow to shallow (100-500 mm), brownish yellow, well-drained, loamy sand soils with scattered surface stones (Cv4, Cv5, Gc2) as well as areas dominated by exposed rock and stones (Ms/R).	9	258.06	50.89
W	Wetland	Wa, Cf, Fw, Fw-D, Kd	Terrain: Seepage zones (Wa, Cf and Fw) and disturbed seepage zones (Fw-D) on footslopes and drainage lines (Kd) in valley bottoms (2-10% slopes). Soil: Grey, imperfectly to poorly drained, sandy soils.	8	68.56	13.52
WD	Wilderness	Wb1, Exc1, Exc2	Terrain: Excavated areas (Exc1, Exc2) and rehabilitated excavated areas (Wb1) on gentle midslopes. Soil: No remaining natural soil horizons.	3	56.17	11.08
* See soil map, Figure 3b				Total	507.19	100.0

Figure 4b: Land capability map of the remaining extent of the farm Leeuwpoot 283 JS and portion 79 of the farm Blesboklaagte 296 JS

Figure 8: Land Capability Map of the soil study area

Figure 5a: Pre-mining land use map of the proposed Development Area

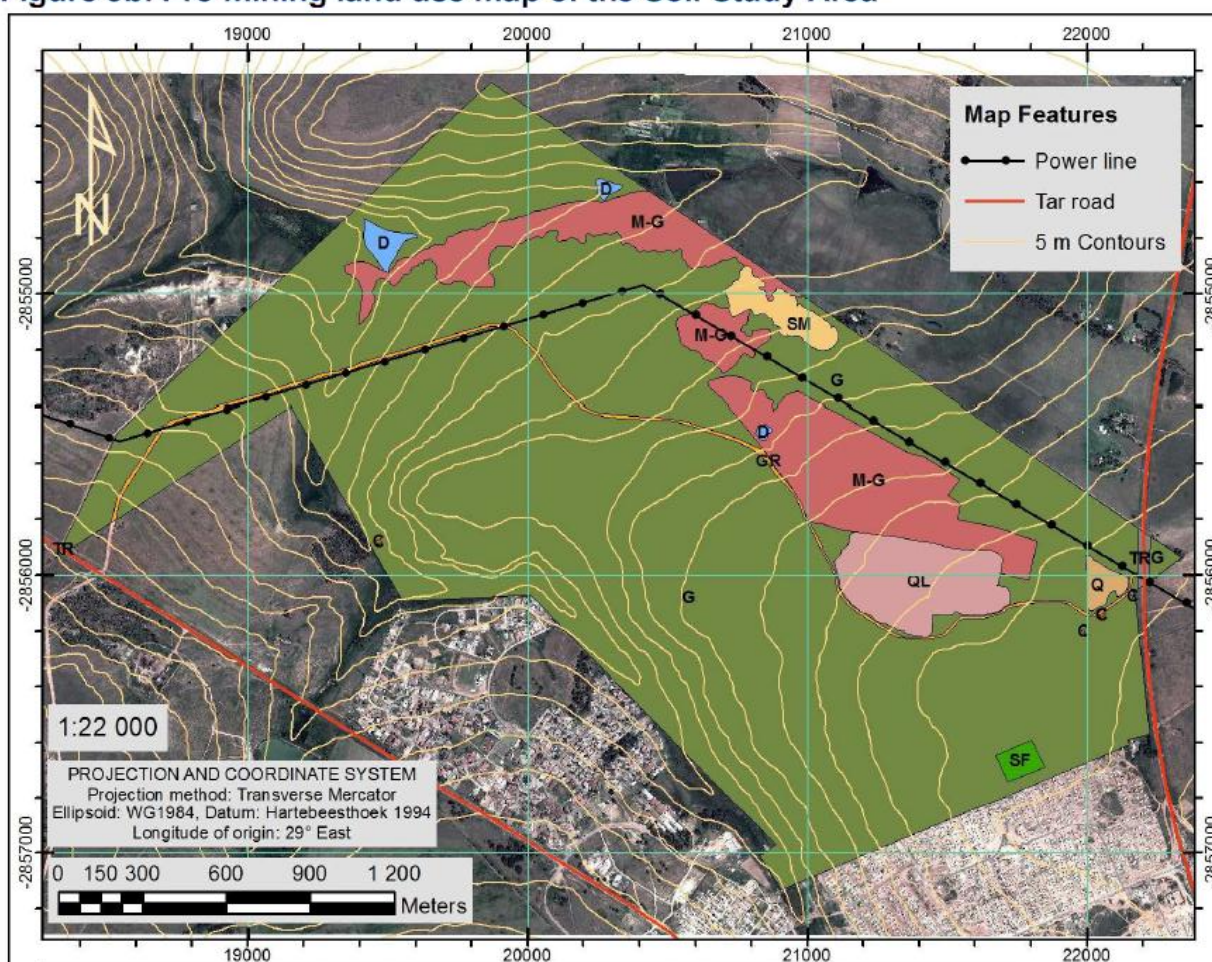


LEGEND – PRE-MINING LAND USE				
Land Use Code	Pre-mining Land Use	Unit Count	Area (ha)	Area (%)
G	Grazing	10	279.34	80.19
M-G	Previously mined or disturbed, currently utilized for grazing to a limited extent.	4	42.56	12.22
Q	Old sand quarry	1	0.02	0.01
QL	Quarry and landfill	1	15.95	4.58
SM	Current sand mining	1	4.76	1.37
D	Dam	1	0.22	0.06
GR	Gravel road	5	3.26	0.95
TR	Tar road	1	0.76	0.22
C	Cemetery	4	0.04	0.01
SF	Soccer field	1	1.49	0.43
TOTAL		29	348.4	100.0

Figure 5a: Land use map of the proposed Development Area situated on the remaining extent of the farm Leeuwpoot 283 JS and portion 79 of the farm Blesboklaagte 296 JS

Figure 9: Pre-mining land use map of the proposed Development Area

Figure 5b: Pre-mining land use map of the Soil Study Area



LEGEND – PRE-MINING LAND USE				
Land Use Code	Pre-mining Land Use	Unit Count	Area (ha)	Area (%)
G	Grazing	4	423.78	83.55
M-G	Previously mined or disturbed, currently utilized for grazing to a limited extent.	3	51.65	10.18
Q	Old sand quarry	1	1.73	0.34
QL	Quarry and landfill	1	15.95	3.15
SM	Current sand mining	1	4.76	0.94
D	Dam	3	2.27	0.45
GR	Gravel road	1	4.69	0.92
TR	Tar road	2	0.82	0.16
C	Cemetery	5	0.07	0.02
SF	Soccer field	1	1.49	0.29
TOTAL		22	507.21	100.0

Figure 5b: Land use map of the remaining extent of the farm Leeuwpoot 283 JS and portion 79 of the farm Blesboklaagte 296 JS

Figure 10: Pre-mining land use map of the soil study area

8.3.2 Physical

Rainfall

The project site lies within a summer rainfall area, with thunderstorms. The mean annual rainfall for the area is 601 - 800mm/annum. The Mean Annual Evaporation (MAE) rate for the area is 1 801 – 2 000mm/annum (Sarovic Development: Environmental Overview Report, 2011).

Temperature

The mean maximum annual temperature for the project area is 27.1°C - 29°C. The maximum temperature during summer months was recorded at 24.7°C – 26.9°C while maximum winter temperature was recorded to be 20.2°C – 21.8°C (Sarovic Development: Environmental Overview Report, 2011).

Wind

According to www.windfinder.com, the prevailing wind direction for Emalahleni is west-north west to north-northwest, as indicated by the figure below (Figure 11). The prevailing wind direction has been determined from yearly wind direction data from December 2011 to November 2018.

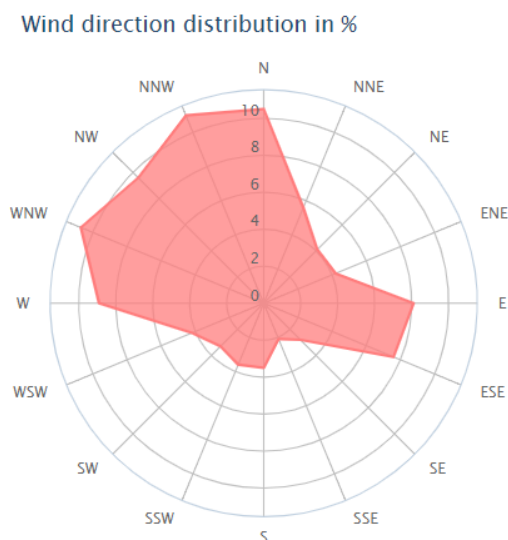


Figure 11: Prevailing wind direction for Emalahleni (<https://www.windfinder.com/windstatistics/emalahleni>)

Topography

The Memoranda for the development, prepared by Korsman & Associates (2014a and 2014b) describe the topography of the site. Pine Ridge Extension 1-4 is located on a gentle gradient that slopes from 1 517 masl (meters above sea level) at the lowest point at the Blesbokspruit, to 1 537 masl at the northern border. Pine Ridge Extension 5-25 is also located on a gentle gradient that slopes from 1 457 masl at the lowest point on the west at the Blesbokspruit to 1 537 masl at the northern border. This is also shown in the figure below (Figure 12).

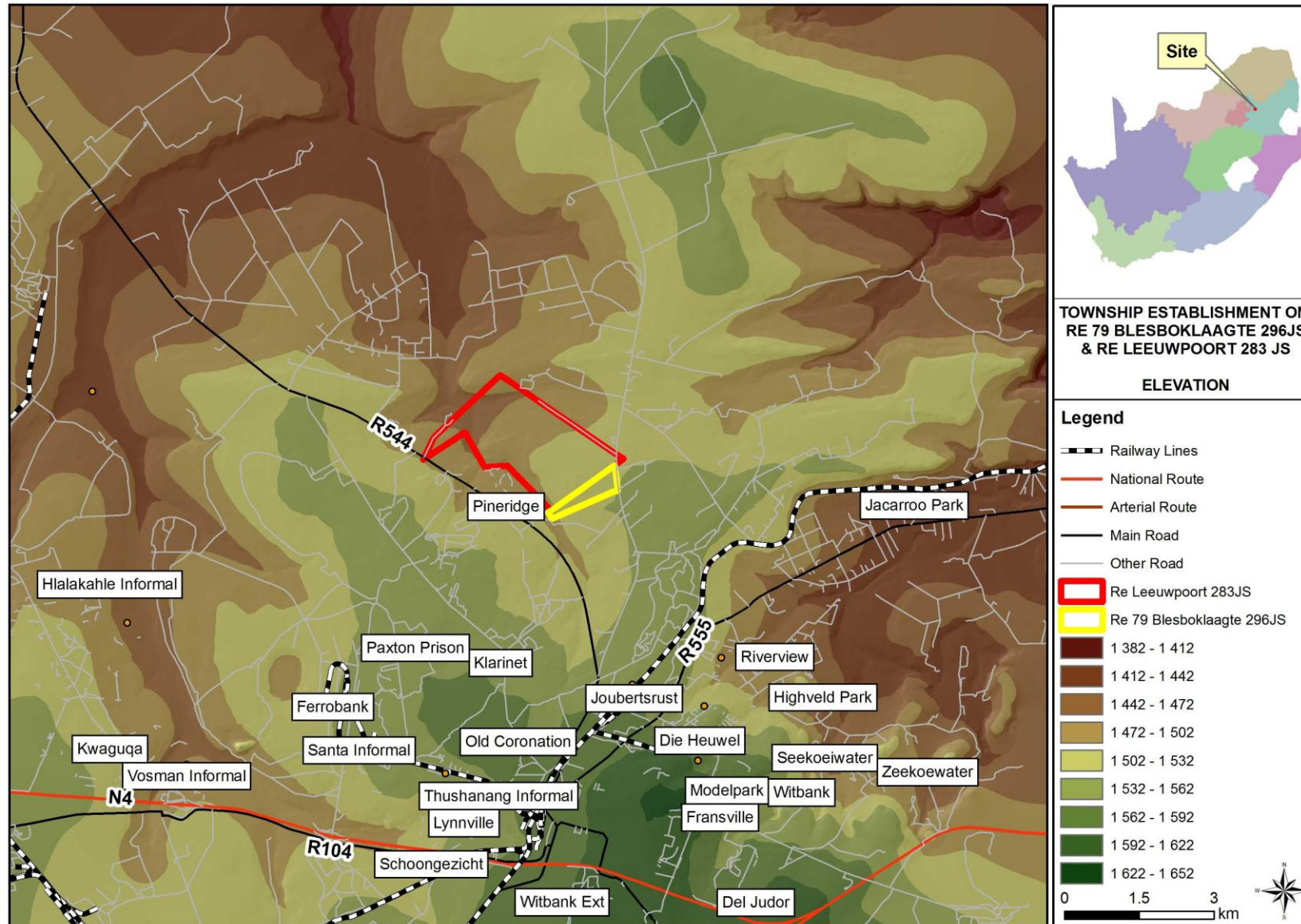


Figure 12: Elevation of the project site

8.3.3 Biological

Fauna

A Fauna Assessment was undertaken for the project site by Rautenbach *et al.* (2014). The full report is attached under Appendix D.

The site is presently used for cattle grazing, however, in the past some earthworks towards the north-east of the site damaged the natural character of the site. There are no forms of development on the site, in the form of buildings. The earthworks to the east, though, have entirely transformed the terrestrial habitat.

The topography of the site and the surrounding area consist of undulating grassy plains typical of the Highveld Grassland biome of the interior. The south-easterly portion of the site overlooking the suburb consists of a rocky slope. Another north-facing slope is some distance from the Blesbokspruit tributary, but is actually an indistinct rim of the Blesbokspruit basin. The major feature of the site is the perennial Blesbokspruit which, for some distance, separates Pine Ridge from the site, however, to the north-west falls entirely within the site.

A tributary of the Blesbokspruit bisects the north-eastern corner of the site. Dams were constructed across both streams. The banks of the streams and dams are overgrown with semi-aquatic vegetation (bulrushes and reeds). These wetland/aquatic systems, together with a rocky slope just outside the site, collectively prompted this portion of the site to be classified as “Important and Necessary” in the provincial C-Plan.

The site falls in the Rand Highveld Grassland vegetation unit (Gm11 of Mucina and Rutherford, 2006). However, large parts of the site consist of regenerating fallow fields that are covered with dense stands of pioneer grasses. These pioneer grasses are currently being grazed by cattle. The majority of the site, including the area subjected to earthworks, is ranked as “Least Concern” and/or “No Natural Habitat Remaining” by the provincial C-Plan.

The soil is generally light and sandy, at places with protruding rock and gravel. The slopes are rocky with light-brown soil. Termitaria were recorded. Barring low indigenous shrubs along the slopes and exotics such as scattered blue gums, the site is entirely devoid of trees. There are no caves for the occurrence of cave-dwelling bats.

To the west and south, the site is bordered by established suburbia, and to the east by the extensive and intensively excavated earthworks. However, to the north the site borders on undeveloped grazing land. Terrestrial vertebrate connectivity can therefore be expected to be operational along the streams as well as to the north.

Mammals

The local occurrences of mammals are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. Therefore, it is possible to deduce the presence or absence of mammal species by evaluating the habitat types within the context of global distribution ranges. Three major habitat types are present on the study site, i.e. terrestrial, and to a lesser extent, rupicolous and wetlands.

The terrestrial habitat is the most extensive habitat found on the project site. However, it has been ecologically over-used by past tillage practices, grazing activity as well as possible irregular fires. As such, it can only be rated as a “Very Low” to “Low” conservation condition. Secondary grasslands can be lush and is therefore good cover for terrestrial mammals.

The rupicolous habitat found along the rocky slopes is poorly developed and contains a lack of refuges in the form of nooks and crannies amongst the large rocks. However, less discerning species, such as the Namaqua rock rat and rock elephant shrew, are more likely to find refuge here. As such, they are deemed to be present, with red rock rabbits being

recorded. Basal cover of the slopes has less evidence of degradation by grazing than the lowlands. Therefore, the area is in an ecological state of repair, justifying a conservation rating of “Average”.

The wetland habitat along the Blesbokspruit, its tributary and the dams are the main features of the site. Semi-aquatic vegetation found along the banks is excellent habitat for species such as shrews, vlei rats and marsh mongooses. Reed beds and stands of bulrushes, as well as other semi-aquatic vegetation are not utilised by cattle and the conservation status of this habitat can be rated as “Good”.

Large mammals such as elephants, buffaloes, rhinos, lions, leopards and hyenas have long since been eradicated from the area for sport, and latterly in favour of cattle farming. Discreet but widespread species, such as brown hyenas, caracal and leopards have also succumbed to encroachment by civilisation.

It is assumed that 40 species of mammal are still part of the present-day mammal species assemblages of the area. The occurrence of three species was confirmed. The presence of persistent species such as porcupines, cane rats, springhares etc. was not confirmed, but considering the extent of the district and the excellent connectivity towards the north, it can be assumed that they are at least occasional vagrants onto the site. Most of the species of the resident diversity are common and widespread (viz. scrub hares, red rock rabbits, multimammate mice, pygmy mice, genets, mongooses and others). Many of these species are robust (some with strong pioneering capabilities). The reason for their survival success is predominantly seated in their remarkable reproduction potential.

However, it should be emphasised that the species diversity (that being species richness superimposed on population numbers) is low. This is as a result of the poor conservation index of the ground cover and the constraining effect of patches of unyielding compacted substrates. Notably, there was a failure to record the presence of any rodent moles. This abundant rodent is, however, still listed as a possible resident based on its universal occurrence in a variety of habitats.

Duiker and Steenbok still occur, at least occasionally, on the site since immigration from the district is likely. Old damage found on termite mounds suggests the presence of aardvark, however no fresh signs were encountered. As such, it is not certain whether aardvark still persist on the site. Given the connectivity towards the northern undeveloped properties, though, immigration is possible.

Black-backed jackals are likely to still occur in the district and can be expected to at least occasionally venture onto the site. The small carnivores (mongooses and genets) are exceptionally reticent in habits, apart from having wide habitat tolerances and forgiving diets. As a result they persist in areas in close association of human occupation as long as prey densities remain at sustainable levels. Although the dams offer good haunts for the two otter species, it is submitted that the dams and the streams are too isolated to have allowed immigration. However, marsh mongooses are not as restricted to open water as otters and are therefore better migrants: this species is thus regarded as a member of the mammal species assemblage.

Man-made structures have provided excellent roosting opportunities in the Highveld, and as such have allowed for the expansion in distribution ranges and population numbers of the listed free-tailed bat and the *Vesperugo* bats; in this instance the houses in the vicinity. *Vesperugo* bats are more tolerant towards roost opportunities and it is more than likely that small colonies found roosting opportunities in the roofs of building near the study site. Free-tailed bats are likewise partial to narrow-entrance roosts provided by buildings and in some instances roost occupation could reach epidemic proportions. The study site offers no caves or suitable structures answering to the exacting roosting requirements of cave-dwelling bats (*Hipposideridae*, *Rhinolophidae*, *Nycteridae*), but it is likely that they have roosts elsewhere and at times commute to the site to hawk for invertebrates rising over the wetlands during summer sunsets.

The species richness is low for such an extensive area. This is likely due to the fact that two of the three habitats have been transformed by past land-use changes (terrestrial) or weakly developed (rupicolous). The quality of conservation is largely ranked as poor and this has resulted in the displacement of Red Data species.

The presence of the following species onsite was confirmed during the site visit:

- Aardvark – *O. afer* – confirmed based on damage to termitaria
- Red rock rabbit – *P. randensis* – confirmed based on faecal pellets
- Highveld gerbit – *G. brantsii* – confirmed based on the presence of burrows

Red Listed Mammals

The four shrew species and the African weasel cited as “Data Deficient” are not necessarily endangered. These small mammals have not been adequately studied to provide quantitative field data to accurately assign a conservation ranking. As a precaution they are therefore considered as ‘Data Deficient’. Shrews and weasels exist at the apex of the food pyramid, which means that their population numbers are inevitably significantly lower than that of similar-sized herbivorous mammals and especially of their smaller prey species. Because of the diet of these voracious little insectivores/carnivores, they are furthermore not readily trapped with conventional bait or traps which may mean that their numbers are under-estimated. Good results obtained with drift fences and pitfalls support the latter statement.

Hedgehogs are ‘Near Threatened’ as a result of interference by humans and their pets. Under natural conditions, the passive defence mechanisms of these rather docile insectivores are sufficient to maintain breeding populations in a healthy condition. Considering the size of the district and connectivity towards the north it is considered possible that a small population of hedgehogs persist.

No other Red Data or sensitive species are deemed present on the site, either since the site is too disturbed, falls outside the distributional ranges of some species, or does not offer suitable habitat/s.

Birds

Three main avian bird habitats are distinguished on site; various forms of grassland-, wetland- and rocky habitat are present, and are discussed below.

Little to no natural grasslands remain on site, with most of the area being tall secondary sub-climax grasslands dominated by *Hyparrhenia hirta* at various stages of succession over previously fallow croplands and pastures. The substrate on site is predominately deep sands, exposed as open patches by sparse ground cover in some areas. Denser and more varied moist grasslands occur along the banks and alluvial borders of the Blesbokspruit and its tributary. These grasslands are expected to support a subset of the more common highveld grassland avifauna, probably at relatively lower densities. Variations in pressures from grazing by cattle and burning are the main factors controlling local differences in grass composition, height and density, especially in the moister areas.

The Blesbokspruit, running mainly along the south-western side of the site is the main wetland feature, along with its tributaries, most obviously the one entering from the east, and together they form the most sensitive habitats on site. The watercourses have mainly narrow stream beds, bordered by areas of riparian and alluvial flats of varying width and augmented by broad areas of open water where they have been dammed. Permanence of surface water probably depends on the patterns of storage in and seepage from the sandy substrates, plus the buffering by vegetation cover and sponges, so some sections may be seasonal and others perennial through time. Runoff and seepage has also accumulated on the bare floor of the major excavation.

The vegetation along the drainage lines and around the dams varies from tall dense stands of bulrushes and/or reeds, to dense moist grasslands, with some bare sandy and rocky shores around excavations. The densest of the few woody

areas on site are also generally riparian, apart from the taller and more scattered eucalypt trees. Riparian plant growth and diversity probably depends partly on nutrients entering and grazing pressures on the systems, such as the densification along the major tributary. The wetlands, at least in their current form, are expected to support a reasonable proportion of the main aquatic and marsh bird species in the area, an avifauna that is adapted to moving between these linear and/or patchy habitats as their condition and quality alters through the seasons and years.

Underlying rock formations appear where the sandy surface has been either eroded away or excavated. This is typical of hill crests and on the floor of excavations. These rocky areas appear as scattered large rocks of various sizes, rather than as solid formations (such as cliffs, caves or crags which are typically favoured by rupicolous species). Relatively few bird species are specific to these rocky habitats in their limited form on site.

The suburban and communal residential areas that border the site are more diverse and have wooded garden plants, provision of water sources as well as spillage of food that supports additional common bird species. These species are likely to pass over the site, or visit briefly for feeding or roosting, but are not considered typical to the site. The few large exotic trees on site may serve as resting sites for these transients, but are unlikely to attract and support their own particular avifauna.

A total of 198 - 260 bird species have been recorded in the Witbank area. Out of these, only 180 are expected to occur in and around the site. Eighty (80) have a high probability of occurrence, 56 have a medium probability of occurrence and 43 have a low probability of occurrence, which indicates the limited potential of the best habitats, but the relatively poor condition of the remainder.

Based on the total of 273 assessments of predicted habitat preference, the wetland habitats are potentially the richest and most distinctive habitat, predicted to be used by 133 (49%) of the expected species, compared to 80 (29%) for the open grasslands and 60 (22%) for the rocky grasslands.

Red Data Listed Birds

Threatened species are included on the list of expected species if they have been previously recorded and/or are suspected to occur in the study area, regardless of the probability of their occurrence, so that, based on the Precautionary Principle, they are included even if they have a low probability. Thirteen (13) species of international and/or national conservation concern may occur on site, ranging from Least Concern to Endangered, although none were recorded during the survey:

- Melodious Lark – Least Concern
- Blue Crane – Near Threatened
- Back-winged Pratincole – Near Threatened
- Pallid Harrier – Near Threatened
- Abdim's Stork – Near Threatened
- African Grass-Owl – Vulnerable
- White-bellied Korhaan – Vulnerable
- Secretarybird – Vulnerable
- Lanner Falcon – Vulnerable
- Southern Bald Ibis – Vulnerable
- Cape Vulture – Endangered
- African Marsh-harrier – Endangered
- Yellow-billed Stork - Endangered

Most threatened species are expected to make use of the grasslands, a few including use of the wetlands, but only three are largely dependent on the wetlands. Only two species are expected to be frequent visitors, the Least Threatened Melodious Lark when the grasslands form suitably patchy habitat for it to occupy the area and maybe even breed, and the Vulnerable Southern Bald Ibis, but only for foraging when short and/or burnt grasslands are formed for nomads from breeding colonies as close to the east as the Middleburg area. The remaining species are expected as erratic visitors or infrequent vagrants, due to a combination of the inferior habitats available and/or a low visitation rate to the region.

Only two species might be expected to sometimes stay over in the area for longer periods (the Melodious Lark and the Vulnerable White-bellied Korhaan), roosting and maybe even breeding should conditions be conducive – although it should be noted that the latter species is only expected as an erratic visitor at best based on the quality of habitats available.

Herpetofauna

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is therefore possible to deduce the presence or absence of reptile and amphibian species by evaluating the habitat types within the context of global distribution ranges.

Arboreal habitat is absent in a functional sense, since indigenous trees with higher and denser canopies are absent from this Highveld vegetation unit. Some low-canopy woody vegetation is present in the rocky ridges towards the south of the study site. These are too few and too small to accommodate arboreal reptiles. This is apart from them being a considerable distance outside of their distributional ranges. Due to the absence of indigenous trees, the low number of exotic trees on the study site and the collection of firewood, there are almost no dead logs, which could have provided shelter and food for some herpetofauna.

Natural rupicolous habitats are present in some places on the study site in the form of scattered stones and rocks. Although limited in extent, this habitat is judged to be prime habitat for rupicolous reptiles and amphibians, due to the many large boulders and rocks that form nooks and crannies as refuges for herpetofauna. The presence of terrestrial, arboreal and wetland-associated vegetation cover in the nearby vicinity makes the site even more important.

The major feature of the site is the perennial Blesbokspruit and its associated tributaries. There are also quite a number of pans and dams on the study site. Although some wetlands are artificial and originate from farm dams, these are functional with several wetland plant species, and also wetland fauna. It is justified to state that the surrounding areas of Emalahleni/Witbank are water-rich. As a consequence, ample habitat is available for water- and moisture-reliant herpetofauna. All rivers, streams and wetlands are protected in Mpumalanga and are regarded as being sensitive. Connectivity as a whole varies from fair to good and real opportunities for migration exist along streams and near pristine grasslands, while existing roads are huge barriers to connectivity.

Of the 45 reptile species that may occur on the study site, three were confirmed during the site visit and of the possible 19 amphibian species that may occur on the study site; three were confirmed during the site visit.

The presence of the following species onsite was confirmed during the site visit:

- Spotted Sand Lizard – *Pedioplane lineocellata* – sight record
- Eastern Striped Skink – *Trachylepis striata* – sight record
- Transvaal Gecko - *Pachydactylus affinis* – sight record
- Common Platanna - *Xenopus laevis* – sight record of juvenile
- Common River Frog - *Amietia angolensis* – sight record
- Striped Stream Frog - *Strongylopus fasciatus* – vocalisation

Sixty-four (64) herpetofauna species are recorded as potential occupants of the study site. Most of these herpetofauna species are robust generalists with the ability to capitalise on disturbed environments. It should be noted that potential occurrence is interpreted as being possible over a period of time, as a result of expansions and contractions of population densities and ranges that stimulate migration.

Red Data Listed Herpetofauna

The striped harlequin snake has not been recorded in the quarter degree square of the site (TVL Museum Records). The study site contains moribund termitaria, where this species is most likely to be found. It is very difficult to confirm whether this cryptic snake is present on any study site, but a small possibility exists that the striped harlequin snake occurs on this particular study site. The spotted harlequin snake is usually found in deserted termite mounds or under rocks (Alexander & Marias, 2007). These types of micro habitats are not abundant on the study site, but do occur in some places.

The many-spotted snake is a secretive snake. Potential habitat for this snake species is wetland-associated vegetation cover at the water edge. If the water bodies with their buffer habitat are protected, this species should also be protected.

The study site falls outside the natural range of the plain stream frog, spotted shovel-nosed frog and whistling rain frog, and these species should not occur on the study site.

Although distribution records for the giant bullfrog in Mpumalanga are patchy, potential breeding sites for them are present on the study site. These breeding sites are temporary, which bullfrogs prefer in order to avoid predation from fish. They also need water bodies of which at least one side has a very gentle slope. A gentle slope allows for shallow water (less than 9cm deep), which enables the female bullfrog to stand when she lays her eggs outside the water for the male to fertilise. Many parts of the study site consist of sandy soil and are very suitable as a dispersal area, which combines feeding and aestivation. It is essential that the soil be suitable for burrowing on a daily basis during the short activity period at the beginning of the rainy season and for deeper retreats during the resting periods. Importantly, the giant bullfrog's status has changed from Near Threatened to Least Concern in South Africa (Rautenbach *et al.*, 2014).

Vegetation/Flora

A Vegetation Assessment was conducted for the project site by Dimela Eco Consulting (2014). The full report is attached under Appendix D.

Historical aerial images (Google Earth) indicated that much of the northern and eastern portions as well as a small portion of the north westerly corner of the site were historically cultivated. Disturbances along the tributary of the Blesbokspruit were noted due to the large quarry situated on the northern section of the site. Large herds of cattle presently graze the site, and numerous kraals, past and present, were noted on the site. These kraal areas were transformed, and a number of weedy plant species were found.

The proposed development site is situated within the Grassland Biome of South Africa, and is dominated by grasslands wherein high summer rainfall, combined with dry winters, frost and veld fires lead to unfavourable conditions for the growth of indigenous trees. Thus, the grassland biome consists mainly of grasses and plants with perennial underground storage organs. The majority of Rare and Threatened plant species in the summer rainfall regions of South Africa are restricted to high-rainfall grasslands, making the Grassland Biome in most urgent need of conservation.

As per the National Vegetation Map, the vegetation type that is expected to occur on the study site is classified as Rand Highveld Grassland (Mucina & Rutherford, 2006). In its natural state, Rand Highveld Grassland is a species rich grassland that vary from sour grassland to low shrubland on rocky outcrops and steeper slopes. The landscape is

typically variable with sloping plains, ridges and undulating plains (Mucina & Rutherford, 2006). It is a poorly conserved vegetation unit with much of its area transformed by cultivation, grazing, and mining.

The Rand Highveld Grassland is classified as an 'Endangered' vegetation unit, but is listed as a 'Vulnerable' ecosystems based on irreversible loss of natural habitat.

Mpumalanga Biodiversity Conservation Plan (MBCP)

The Mpumalanga Biodiversity Conservation Plan (MBCP) groups the biodiversity assets of Mpumalanga into six conservation categories, based on the measured distribution of hundreds of biodiversity and ecological features throughout the province, that are analysed for rarity and response to the pressures of various forms of land-use that diminish them. The conservation categories are:

1. Protected areas currently under formal biodiversity protection;
2. Irreplaceable areas, in urgent need of Protected Area status;
3. Highly Significant areas, requiring strict land-use controls;
4. Important and Necessary areas, requiring special care;
5. Areas of Least Concern, providing areas for development; and
6. Areas with No Natural Habitat remaining, providing preferred sites for all forms of development.

According to the MBCP, the site comprised mainly of areas classified as having "No Natural Habitat Remaining" and "Least Concern" to reach conservation targets. However, a portion classified as "Important and Necessary" to reach the conservation targets of the province is situated on the northern boundary of the site. Areas that are classified as "Important & Necessary" are significantly important areas of natural vegetation that play an important role in meeting biodiversity targets. As per the MBCP, these areas should only be used to benefit the biodiversity assets and reducing the vulnerability. Therefore, land uses that transform the natural state are not supported in "Important and Necessary" areas.

The following vegetation groupings are present on the study site:

1. Transformed vegetation
 - Alien invasive tree clumps; and
 - Areas transformed by mining and intense trampling and grazing by cattle.
2. Grassland
 - Secondary and Degraded grassland;
 - Rocky grassland; and
 - Moist grassland.

Transformed vegetation

- Alien invasive tree plantations: The transformed land on site was characterised by vegetation that no longer comprised of the expected natural grassland species diversity. Instead, the transformed land was dominated by alien invasive tree species. Clumps of *Acacia mearnsii* and *A. dealbata* (Wattle species) and *Eucalyptus camaludensis* (Red River Gum) were likely planted and from there spread into disturbed soils and along moisture gradients on the site. The *Eucalyptus* species is a declared category 1b invasive plant and must be removed. Due to the degraded nature of the transformed land, no plant species of conservation concern were observed in this area and neither are these species expected to persist within the transformed land.
- Areas disturbed by mining and cattle kraals: A large quarry area was situated on the north-eastern portion of the site. There is evidence that much of the north-eastern section of the site has been quarried historically. This area is

highly degraded from the natural grassland state. Rehabilitated areas surrounding the quarry include a number of indigenous pioneer grass species such as *Hyparrhenia hirta* (Common Thatching Grass), *Cynodon dactylon* (Couch Grass) and *Eragrostis gummiflua* (Gum Grass). The herbaceous layer comprised of weedy species such as *Richardia brassiliensis* and *Solanum sisymbirifolium*.

The site has also been grazed by large herds of cattle. The kraal area, situated on the northern portion of the site in close proximity of the confluence of the Blesbokspruit and the tributary, shows evidence of being moved a number of times. As a consequence, there are a number of overgrazed and trampled patches, which have subsequently been colonised by weedy and pioneer species, as well as the exotic grass *Pennisetum clandestinum* (Kikuyu Grass). No plants of conservation concern were observed in the transformed areas. The high degree of transformation and invasive species lowers the ecological function, as well as conservation value of these areas.

Grassland

Grassland vegetation present on the site was characterised by the dominance of grass and herbaceous species, with a limited number of tree and shrub species present. The various patches of grassland were observed to vary in species composition depending on past and current land use, as well as its position in the landscape. Lower lying areas were observed to contain plant species adapted to temporary or permanently wet soils, while other grassland areas contain rocky substrate and a higher plant species composition. Yet other portions were degraded due to grazing or in a secondary state due to historic cultivation.

- Secondary and degraded grassland: Secondary grassland was observed where past cultivation removed the vegetation layer and disturbed the soils. Prolonged cultivation reduced the seed bank in the soils as well as the likelihood of geophytes (e.g. bulbs) surviving. Although the fallow lands were colonised by indigenous grass and some herbaceous species, the species diversity remained low compared to what could be expected in intact, primary (undisturbed) Rand Highveld Grassland (Mucina & Rutherford, 2006). The following species were observed:
 - *Hyparrhenia hirta* (Common Thatching Grass);
 - *Eragrostis curvula* (Weeping Love Grass);
 - *Aristida congesta*; and
 - *Cynodon dactylon* (Couch Grass);
 - *Selago densiflora*;
 - *Hypoxis rigidula*;
 - *Oldenlandia herbacea*;
 - *Pollichia campestris* (Waxberry); and
 - *Seriphium plumosum* (Bankrupt Bush).

A number of weedy species (*Richardia brasiliensis*, *Solanum elaeagnifolium* (Silverleaf Bitter Apple) and *Solanum sisymbirifolium*) were found at the site, growing abundantly where grazing and trampling took place. One geophyte, a *Gladiolus* specie, was observed in the secondary grassland as well as in the rocky grassland. The plant was dormant and the dried plant parts hampered identification to species level. It is likely that more individuals occur sporadically in the secondary grassland.

Although grassland re-established within the fallow lands, succession has not yet progressed to the point where the original species diversity was reached. It is thought that the constant grazing pressure within the secondary grasslands on site will likely keep these grasslands in a subclimax state/secondary state.

Degraded grassland: Degraded grasslands comprised grassland that was degraded by continuous grazing pressure as well as the invasion of alien invasive plant species such as *Pennisetum clandestinum* (Kikuyu Grass) and various *Solanum* species. The grassland was further characterised by a diversity of Increaser II and III grasses (grass

species that increase in over utilised/overgrazed veld) and a high frequency of the shrub *Seripheum plumosum* (Bankrupt Bush), which is known to increase in overgrazed grassland.

Continuous grazing pressure reduced palatable grasses and subsequently changed the species composition from what is expected in natural Rand Highveld Grassland (Mucina and Rutherford, 2006). The degraded grassland included grasses such as *Eragrostis chloromelas* (Curly Leaf), *E. rigidor* (Broad Curly Leaf), *Cymbopogon caesius* (Broad-leafed Turpentine Grass), *Cynodon dactylon* (Couch Grass), *Eragrostis gummiflua* some *Pogonarthria squarrosa* (Herringbone Grass) and *Hyparrhenia hirta* (Common Thatching Grass). The herbaceous layer included *Pollichia campestris* (Waxberry), *Gnidia kraussiana* and *Hermannia depressa*.

At the time of the survey, the transformed and degraded grasslands were found to have a lower species diversity than that of the rocky grasslands which, although grazed, were never ploughed. At the time of the survey, 18 grass species (of which the majority were pioneer or Increaser I & II species), 33 herbaceous and small shrub species and 7 invasive plant species were noted. Other than what appeared to be *Gladiolus elliotti* (a provincially protected species that was dry at the time of the survey), no plant species that are known to be of conservation concern were observed within the secondary and degraded grasslands.

- Rocky grassland and near-natural grassland: Areas that were not historically ploughed or severely trampled and grazed were included in the rocky grassland vegetation grouping. The rocky grasslands were observed on top of the ridge growing on and between rocky sheets, boulders and within shallow soils. Rocky grasslands were also noted on the slopes and lower lying areas where rocky sheets occurred sporadically. The shallow soil layer was likely the reason that these areas were not historically ploughed. A higher diversity of species that naturally occur within the Rand Highveld Grassland was found, although a number of Increaser II & III grasses dominated due to the high grazing pressure. At the time of this survey, the rocky grasslands were grazed short, and in some areas a low basal cover was noted (especially areas where short term disturbances i.e. under the powerline took place).

Grasses such as *Monocymbium ceresiliforme* (Boat Grass), *Eragrostis curvula* (Weeping Love Grass), *Harpochloa falx* (Caterpillar Grass), as well as the increaser grasses *Aristida congesta* and *Cynodon dactylon* (Couch Grass) were observed. The grazed ridge and rocky sheets lower down contained large numbers of the shrub/small tree *Lopholaena coriifolia* (Pluisbossie). These plants, in high numbers, are an indicator of shallow rocky soils and poor veld management. Although it naturally occurs in the Rand Highveld Grassland, it is prone to encroachment should overgrazing occur. In addition, the shrub *Seripheum plumosum* also occurred in patches within the rocky grassland. A number of additional shrubs and small trees were identified within the rocky grassland area.

The ridge area contained a number of plants of conservation concern. One individual of the Declining bulb *Boophone distichia* (Poison Bulb) and the Rare *Pavetta zeyheri* subsp. *middelburgensis* were observed, while the provincially protected *Protea welwitschii* (White Sugarbush) grew abundantly on the ridge. An unidentified *Crinum* species (thought to be *Crinum graminicola*) was also observed to occur sporadically in the rocky grasslands, but in deeper soils. Only one (1) invasive species (*Richardia brasiliensis*) was noted in the area.

At the time of the survey, 11 grass species, 67 herbaceous and small shrub species and 4 tree species were observed within the rocky grassland vegetation grouping. Only one invasive species (*Richardia brasiliensis*) was noted. The rocky grasslands comprised the highest species diversity. Although the grazing pressure is high; there are disturbances from encroachment from alien invasive species; and likely a lack of fire, the rocky grasslands were representative of the Rand Highveld Grassland. It is therefore of a higher conservation concern than the secondary grasslands.

- Moist grassland: Moist areas and seepage were observed along the Blesbokspruit and the tributary on the northern boundary of the site. These seep areas extended into the rocky grasslands and included species that are adapted to grow in temporary saturated condition, likely due to an impervious soil layer. Even areas where sand was likely mined in the past, showed clear signs of surface and subsurface water movement towards the tributary. Much of the seep areas in the northern portion of the site were overgrazed due to the availability of moisture for longer periods during the year.

Permanently moist areas, such as the Blesbokspruit and the tributary, were dominated by the tall growing grass, *Phragmites australis* and the reed *Typha capensis* (Bulrush).

The moist grasslands are well vegetated and play a role in the functionality of the wetlands on site, and the associated hydrology thereof. This is in spite of the fact that sand mining historically impacted on the tributary, and grazing and invasive tree species currently impact upon the moist grassland.

The flora assessment recorded 15 grass species, 17 herbaceous species, 8 sedges, and 4 alien or invasive plant species within the moist grasslands. Moist grasslands are expected to have a lower diversity than terrestrial grasslands as fewer plants are adapted to grow in saturated conditions. It is likely that some plant species of conservation concern such as *Crinum bulbispermum*, *Eucomis autumnalis* and a number of orchid species could occur in the moist grasslands. However, these were not observed, likely due the disturbed nature of some of the moist grassland, as well as grazing pressure and seasonality. A wetland buffer zone should be adequate to protect these plants if they do indeed occur.

Nationally Protected Plants

A list of twelve (12) plants of conservation concern was compiled. Of these, one specie is classified as *Endangered*, two are *Vulnerable*, three are *Near Threatened*, four are *Declining*, one is naturally *Rare* and one is classified as *Data Deficient*.

During the field survey, species for which suitable habitat exists on site were surveyed for. Of these short-listed species, suitable habitat existed for about four species, while two were confirmed to occur. The *Declining* species *Boophone distichia* (Poison Bulb) and the *Rare* species (*Pavetta zeyheri* subsp. *middelburgensis*) were confirmed to occur within the rocky grassland on the ridge. A *Crinum* species, thought to be *Crinum graminicola* was also recorded on site. Although this plant is not threatened, the closely related *Crinum macowanii* is a *Declining* species that may occur on the site. The flowering period (October-December) should be used to confirm this.

The *Endangered* *Frithia humilis* is a small succulent, which is known to occur within the area that the site is situated in. However, this plant was not observed during the investigation, and the absence of gravelly quartz on the rocky sheets surveyed makes it unlikely that the plant occurs on site.

Although only one individual of *Boophone distichia* (Poison Bulb) was identified, it is likely that more plants could be present. Poison Bulb is extensively harvested for the medicinal plant trade and therefore the numbers in the wild is declining. If the *Boophone distichia* and the *Pavetta zeyheri* subsp. *middelburgensis* are deemed to be under threat of the proposed development, the plants should be removed and relocated to nearby, suitable habitat. Note that these plants can only be removed with permission of the Mpumalanga Tourism and Parks Agency (MTPA).

Provincially Protected Plants

A number of plants are provincially protected by the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998). These species may not be removed, pruned or damaged without a permit from the Mpumalanga Tourism and Parks Agency (MTPA).

Four provincially protected species were confirmed to occur on the site:

- *Crinum* species – all species are protected, however the species is likely to be *C. graminicola* (sighted at 25°48'16.77"S; 29°11'36.90"E and 25°48'31.81"S; 29°11'53.32"E).
- *Protea welwitschii* – all species are protected, and it was confirmed to occur in rocky grassland on the hill directly east of the Blesbokspuit.
- *Gladiolus* species – all species are protected, and sporadic occurrence of at least two species in rocky and secondary grassland were observed (sighted at 25°48'37.01"S; 29°11'47.04"E, 25°48'32.82"S; 29°11'7.21"E and 25°48'58.95"S; 29°12'59.48"E).
- *Pellaea calomelanos* – species is protected, and was confirmed to occur in rocky grassland, wedged between rocks (sighted at 25°48'17.46"S; 29°11'35.35"E and 25°47'53.28"S; 29°11'53.85"E).

Two provincially protected species were likely to occur, but were not confirmed to occur on site:

- *Eucomis* species (Pineapple plant) – all species are protected, and are likely to occur in moist- and rocky grassland;
- *Habenaria* species, *Eulophia ovalis* subsp. *ovalis*, *E. welwitschii* – All belong to Orchidaceae and are protected, and possibly occur in moist grasslands (often overlooked when not in flower from Feb-April).

Medicinal Plant Species

Rising demand for medicinal plants has led to increased pressure on wild plant populations. This combined with shrinking habitats, means that many species in South Africa are now facing local extinction (Botha *et al.*, 2004). The demise of medicinal plant species holds dire consequences both socially and ecologically. People stand to lose their medicine, and in the case of traditional healers and plant gatherers, their livelihoods (McKean, unknown). Medicinal plants that are highly utilised will soon become extinct as they are harvested from natural environments or destroyed by development and mining. The trade in medicinal plants is high and it is unlikely that at current levels of exploitation, the sustainable supply of medicinal plants will ever meet the demand. Therefore, it is important to be able to identify areas that could potentially support, or provide plants to the medicinal plant trade (Emery *et al.*, 2002). A minimum of 16 plants known to be used medicinally were recorded on the study site.

Alien Invasive Plant Species

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme.

The following category 1b species exist on the site and must be removed by implementing an Alien Invasive Plant Management Programme in compliance of Section 75 of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004):

1. *Cirsium vulgare* (Scotch Thistle)
2. *Eucalyptus camaldulensis* (Red River Gum)
3. *Solanum sisymbirifolium* (Wild Tomato)

Vegetation Importance and Sensitivity

Vegetation of Low Sensitivity

Vegetation with low sensitivity is generally degraded and disturbed vegetation with little ecological function and is usually species poor (most species are usually exotic or monocultures e.g. maize). This vegetation has little or no conservation potential.

Transformed Land: The transformed land displayed low or no species diversity and comprised mainly of clumps of Wattle and Blue Gum trees, as well as the area disturbed by the past and current quarry activities. No plants of conservation concern or provincially protected plants were observed or expected to occur within the transformed vegetation (*Figure 14*).

Secondary and Degraded Grassland: The secondary grasslands as well as the Degraded grasslands comprised of a relatively low species diversity. These grasslands were extensively grazed. It does, however, provide open space for the movement of fauna species, but it is thought that no plants of conservation concern persist here. The only plant species of concern was the provincially protected *Gladiolus* species within the secondary grassland.

Degraded grassland on the study site show signs of disturbance due to a high grazing pressure and encroachment by alien invasive plant species and as with the secondary grassland, it is unlikely to support threatened plant species (*Figure 14*).

Vegetation of Medium Sensitivity

Vegetation of medium sensitivity comprised slightly modified systems that occur along gradients of disturbances of low to medium intensity with a degree of connectivity with other ecological systems.

Rocky grassland: Rocky grassland on site comprised the highest species diversity and although also subjected to grazing and encroachment, these areas are more likely to support plant species of conservation concern such as *Frithia humilis*. The provincially protected bulb *Crinum cf graminicola* was recorded in this vegetation grouping as well as *Protea welwitschii* and the fern *Pellaea calomelanos*, the Declining bulb *Boophone distichia* as well as the Rare *Pavetta zeyheri* subsp. *middelburgensis*. This vegetation grouping presents remnant Rand Highveld Grassland.

The plants of conservation concern were mainly concentrated on the rocky ridge. The area that included all of these species is marked on *Figure 14* and should be regarded as a sensitive area that should be incorporated into open space planning.

Vegetation of High Sensitivity

Vegetation of high sensitivity comprised communities with low inherent resistance or resilience towards disturbance factors and vegetation that is considered important for the maintenance of ecosystem integrity. Most of these vegetation communities represent late succession ecosystems with high connectivity to other important ecological systems. The vegetation comprised high species diversity and usually provide suitable habitat for a number of threatened species, or the vegetation forms part of protected ecosystems e.g. wetlands, riparian vegetation etc.

Moist Grassland: Moist grassland vegetation was observed on the study site and although these areas were somewhat disturbed, the vegetation is crucial to the functioning and health of wetland systems. The vegetation subsequently plays a role in terms of the hydrology and water quality on the catchment. The vegetation plays a role in:

- **Flow regulation:** Vegetation slows the flow of water, both by physically blocking the passage of water, and by absorbing the water into its root systems. This moderates the impacts of flooding on downstream and surrounding areas.

- **Water quality regulation:** The vegetation acts as a buffer or filter between nutrients, sediments, contaminants and bacteria from the surrounding land and air, and the river channel itself. The vegetation therefore prevents soil, pesticides, fertilizers and oil from entering the river and impacting on in-stream communities.
- **Habitat provision:** Wetlands and riparian areas provide important habitat for many plants and animals, because these are areas of transition between the land and the river. These relatively steep environmental gradients (moisture, temperature, topography and soil) generally support higher levels of biodiversity than more homogeneous areas.
- **Corridor functions:** As it follows the river or drainage line, the moist grassland and riparian vegetation serves as a corridor, connecting two or more habitats that may otherwise be isolated, by land transformation of areas in between. Many species of animals use corridors to disperse and to find food and mates.

In addition, wetlands are protected by national legislation and are essential to maintain ecological corridors for the movement and survival of species within a landscape fragmented by mining and plantations. The hydrological processes associated with the wetlands are closely associated with the intactness of the vegetation within and surrounding these areas. Furthermore, the seasonally water logged soils could provide habitat for some threatened species such as the *Declining Crinum bulbispermum*. Therefore, the vegetation associated with riparian areas and wetlands should be regarded as sensitive.

Vegetation sensitivity compared to the MBCP

The observed vegetation sensitivities were compared to the Mpumalanga Biodiversity Conservation Plan (MBCP). The MBCP classified the terrestrial biodiversity of much of the site as being of low conservation concern in the Province as a whole. This assessment corresponds greatly to the MBCP as much of the grassland vegetation was found to be degraded. The MBCP indicated a portion of “Important and Necessary” land at the confluence of the tributary and the Blesbokspruit. This area is also included in this report’s sensitive moist grasslands and adjacent rocky grassland areas.

Conclusion

The vegetation on the proposed site was grouped into two main vegetation categories: transformed vegetation and natural to near natural grasslands. The transformed areas included alien invasive tree clumps, mined areas and grassland that was observed to be severely degraded by overgrazing and trampling. It also included secondary grasslands on historically cultivated lands. These transformed areas were characterised by low species diversities, low ecological function and low conservation importance and were accordingly classified as not posing a constraint to the development in terms of vegetation sensitivities.

The near natural to natural grasslands included rocky grassland and moist grassland. The rocky grassland was also grazed, but comprised a species diversity that is comparable to the regional Rand Highveld Grassland which is an endangered vegetation type. In addition, the rocky grassland included a number of plant species that are of conservation concern, either as they are declining in numbers, rare or protected by the Mpumalanga Conservation Ordinance. Most of these plant species were concentrated on the rocky ridge. Although most of the rocky grassland was classified as posing a medium constraint or sensitivity to the proposed development, the rocky ridge area with its higher frequency of plants of conservation concern was highlighted in the sensitivity map as an area that should be incorporated into open space planning, provided that the area can be adequately maintained during the operational phase of the township development.

Moist grasslands comprised vegetation in and surrounding the Blesbokspruit and its tributary, as well as areas where water seeps out of the soil, likely due to an impervious layer in the soil. Although no species of conservation concern were observed here, these areas are suitable habitat for some plants of conservation concern, furthermore, moist grasslands and watercourses are nationally protected habitats and due to its high ecological function and conservation importance, it was classified as being of a high sensitivity to development.

A number of mitigation measures can be implemented in order for the proposed development to continue, while impacting as little possible on sensitive vegetation groupings:

- Moist grasslands and the rocky ridge where a high frequency of plants of conservation concern occurs, should not be developed. Instead, these areas should form part of open space planning that allows for a movement corridor for species and ecological processes along the Blesbokspruit.
- Construction should not impact on these open spaces and a management plan must be implemented that will ensure that the open spaces are managed as, for example, an ecopark, to prevent deterioration during the operational phase.

If the open space cannot be adequate preserved, the plants of conservation concern should be removed (where survival is possible) and relocated. This can only be done once a permit authorising the removal of the plants is granted by the Mpumalanga Tourism and Parks agency (MTPA). In addition, it is advised that a summer scan (during November) be undertaken to limit the possibility that any plants of conservation concern that were not identified at the time of this report (April survey) are lost (Dimela Eco Consulting, 2014).



Figure 13: Vegetation mapping units of the project site

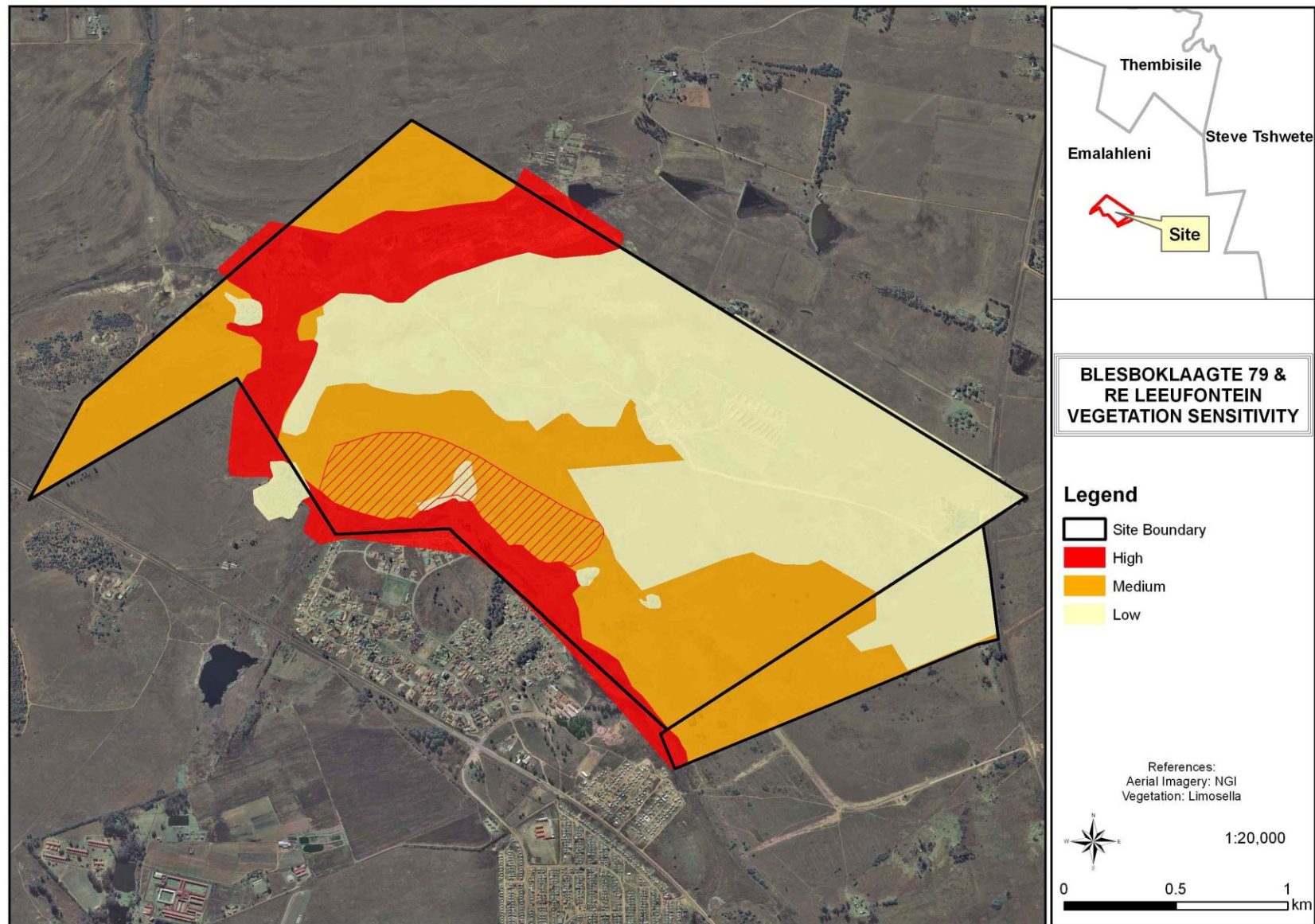


Figure 14: Ecological sensitivity of the project site

Aquatic environment

A Baseline Aquatic Report was conducted by Igdrasil Scientific Services (2014). The full report is attached under appendix D.

The study area is currently mainly used for grazing of cattle and old sand mine activities are evident in the northern and eastern part. The study area is situated within the B11K quaternary catchment. The Blesbok Spruit forms the western boundary of the study area and then runs to the north western part of the study area. Two unnamed tributaries of the Blesbok Spruit enter the study area. The aquatic environment (the Blesbokspruit) was assessed to determine the water quality as well as the Present Ecological Status (PES).

The Baseline Aquatic Report was compiled in order to:

- Provide a literature review of the principles, methods, guidelines and criteria that are applicable to biomonitoring at Blesboklaagte and Leeuwpoort (the study area);
- Determine the current aquatic health of the rivers in the vicinity of the study area using SASS5, IHAS, VEGRAI and FRAI methods at identified sampling points; and
- Report on the findings of the baseline biomonitoring survey conducted on the 8th of April 2014 at the identified sampling points.

For the baseline biomonitoring survey, SASS5 and VEGRAI methods could be used to determine the Overall Ecological Category and River Health at BLB3 and BLB6. All sampling points (BLB1 - BLB6) were visited on the 8th of April 2014. Only BLB3 and BLB6 had a prominent channel with flowing water that met the sampling criteria of SASS5, VEGRAI and FRAI. All sampling points were, nevertheless, evaluated in terms of their surrounding habitat, possible impacts on the aquatic ecosystem and the suitability for future biomonitoring.

The *Overall Ecological Category* for downstream reference site, sampling point BLB3, was D, and for BLB6, it was C. This indicates that the aquatic environment can be considered “fair” to “poor” and is moderately to largely modified. This was higher than the expected condition *Overall Ecological Category* of E, as determined in the PES 1999 assessment for the Blesbok Spruit. The water quality analysis indicated that, for all measured parameters, measures fell outside of the Department of Water Affairs’ recommendations for domestic, irrigation, and livestock watering uses. Looking at IHAS classes, both BLB3 and BLB6 were insufficient to support a diverse aquatic macro invertebrate community.

The aquatic ecosystem of the Blesbok Spruit is already impacted upon and should not be allowed to deteriorate further. During construction and operational phases of the proposed development biomonitoring as well as chemical water analysis should be conducted to ensure no further deterioration occurs.

Recommendations

In order to obtain a comprehensive understanding of the dynamics of the aquatic ecosystem in an area, ecological assessments should always consider investigations at different time scales (across seasons/years) and through replication, as river systems are in constant change. However, due to time constraints such long-term studies were not feasible and only one sampling trip was conducted in late summer.

Biomonitoring should be conducted at least once every four months (seasonally) during construction phase. Chemical analysis should occur on a weekly basis during construction phase and thereafter, if down-scaled, it should at least be monitored once a month.

The current condition of the Blesbok Spruit is higher than the expected condition according to RIVCON, but is still in a poor condition. As conservation offset is recommended that conditions of the Blesbok Spruit should be increased, i.e. reconstruction of damaged weir system at BLB1, upgrade of culvert systems and instillation of proper storm water

management and attenuation ponds. No further degradation of the Blesbok Spruit should be allowed (Iggdrasil Scientific Services, 2014).

Wetlands and watercourses

A Wetland Delineation and Functional Assessment was conducted for the project site by Limosella Consulting (2014). The full report is attached under Appendix D.

The site is situated within quaternary catchment B11K. Precipitation is lower than evaporation rate in this catchment. Consequently, wetlands in this area are sensitive to changes in regional hydrology, particularly where their catchment becomes transformed and the water available to sustain them becomes redirected.

Four (4) wetland areas were recorded on the study site. These wetlands are classified as a Channelled valley bottom wetland and Seepage wetlands. All wetlands on site form part of the same wetland system. The hydrology of the site is depicted in *Figure 15* below and wetlands associated with the site can be seen in *Figure 16* below.

The channelled valley bottom wetland found on the site extends through the northern section of the study site as well as bordering the southern section of the study site. A clear channel can be seen throughout most of the wetland. The wetland has been impacted by roads, grazing and some patches of exotic woody vegetation such as *Eucalyptus* sp. and *Acacia mearnsii*. The main impact associated with this wetland is the numerous areas where the wetland has been dammed up, thus preventing the transport of sediment through the wetland as well as preventing the migration of faunal species through the wetland.

In the northern corner of the study site a large section of exposed soil can be seen, this area has numerous erosional gullies. These are likely due to the upstream quarrying in the adjacent seepage wetland. The close association with the town of Pine Ridge also has an impact on the wetland by creating footpaths, dumping and fringing construction of houses. The wetland vegetation here is mostly intact with thick stands of *Phragmites australis*. Sediment was seen in the edges of the wetland suggesting that the wetland contributes to sediment trapping in conjunction with the associated seepage areas.

A seepage area is found north of the channelled valley bottom wetland, in the northern most corner of the study site, and is found on the foot slopes of the mountainous area. This area is mainly impacted by the large cattle herds located on the wetland. Grazing has had a large impact on the area and large areas of overgrazing have been recorded. A second seepage area is located on the southern border of the study site, north of the channelled valley bottom wetland, and is located on the foot slopes of a small rocky outcrop. The western area of the seepage area is located between two small rocky outcrops. As such, water collects from both outcrops, creating wetland conditions. The third seepage area forms part of a larger seepage wetland, degraded due to the quarrying in this area. However, it is still functional and not as impacted as the rest of the seepage area. Part of this seepage area is however degraded.

The hydrology of the wetland system as a whole has been greatly impacted by the quarrying in the seepage wetland as well as the damming up of the channelled valley bottom. The geomorphology of the area has been impacted by various dumping and digging areas as well as quarrying. The vegetation of the wetland system has also been impacted by the quarrying as well as over grazing.

The “degraded wetland” scored the highest with regards to the Present Ecological State (PES) score, and “seepage area 2” scored the lowest and is therefore considered to be the most natural wetland on site. The other wetlands on site scored similar scores.

The combined Ecological Importance and Sensitivity (EIS) score for the wetland system is **2.3**, falling into a category characterised by moderate ecological importance and sensitivity. As such, it is considered ecologically important and sensitive on a provincial or local scale (Limosella, 2014).

The following is a summary of the updated Wetland Delineation and Functional Assessment, also compiled by Limosella Consulting (2018):

A follow-up site assessment was undertaken on the 8th of November 2018 to inform an update of the wetland assessment report for this project.

Three (3) wetland areas were recorded on the study site (refer to *Figure 17*). The wetland areas were classified as an unchannelled valley bottom wetland, and two seepage wetlands. The unchannelled valley bottom forms part of the Blesbokspruit River and both the seepage wetlands drain directly into the Blesbokspruit River.

The previous study (2014) indicated an additional two seepage areas. Upon further investigation and the additional use of historical aerial imagery, it was found that these areas are unlikely to be functioning wetland areas. The area previously described as a degraded seepage wetland was reclassified as a disturbed area with many quarries, diggings and other disturbances. These disturbances have led to numerous areas of standing water and wetland vegetation and although these areas contribute to habitat for faunal and floral species it is unlikely to contribute to wetland functionality. Furthermore, an additional seepage area was recorded. This area was previously overgrazed with little species remaining. In the 2018 fieldwork, numerous obligate wetland species were recorded here including *Juncus effusus* and *Juncus rigidus*.

The hydrology and geomorphology of the wetland system as a whole has been significantly impacted by the quarrying, diggings and sand mining as well as damming of the unchannelled valley bottom wetland. The vegetation of the wetland system has also been impacted by the quarrying as well as overgrazing. The 2018 study therefore concludes that the seepage area found in 2014 is not currently a functional wetland although it may have been in the past. Implications for development are that the delineated functional wetland as confirmed in 2018 (the channelled valley bottom wetland, seepage 1 and 2), together with their recommended buffer zones should be excluded from the development footprint. The seepage area identified in 2014 and omitted from the 2018 delineation may be included in the development layout given that strict mitigation measures ensure that no negative impact results to the downstream wetlands. A summary of the functional assessment scores obtained for the wetland and watercourses are presented in the tables below. A summary of the important findings discussed in this assessment are also provided (Limosella, 2018).

Classification (SANBI, 2013)	PES (Macfarlane <i>et al.</i> , 2007) and VEGRAI (Kleynhans <i>et al.</i> , 2008)	EIS (DWA, 1999) and QHI (Seaman <i>et al.</i> , 2010)	WetEcoServices (3 most prominent scores)	Scientific Buffer (Macfarlane <i>et al.</i> 2015)		REC
				Construction	Operational	
Unchannelled Valley Bottom Wetlands	3.5 C	3.7 (Very High)	Sediment Trapping – 3.0	37 m	17 m	C
Seepage Wetland 1	3.4 C		Stream Flow Regulation – 2.7	51 m	22 m	C
Seepage Wetland 2	3.6 C		Natural Resources – 2.3	51 m	22 m	C

	Quaternary Catchment and WMA areas	Important Rivers possibly affected
	B11K– 2 nd WMA - Olifants	Drains directly into the Blesbokspruit on the study site
Does the specialist support the development?	Yes. However, it should be done in a manner that does not further alter the natural watercourses, or the biodiversity status of the surrounding habitat.	
Recommendations	<ul style="list-style-type: none"> • The development should take into account the qualified presence of sensitive and protected flora, fauna and avifauna species. • Design of structures should aim to have the least impact on habitat quality and hydrology of the watercourses and should include attenuation structures to contribute to regional flood control and rehabilitation. • Maintain sewage infrastructure to ensure that leaks do not enter the watercourses. • Implement the principles of Sustainable Urban Drainage. • Control of alien invasive plants should form part of the maintenance plan. • Ensure that overgrazing in the wetland does not occur. • Install and maintain litter traps. 	

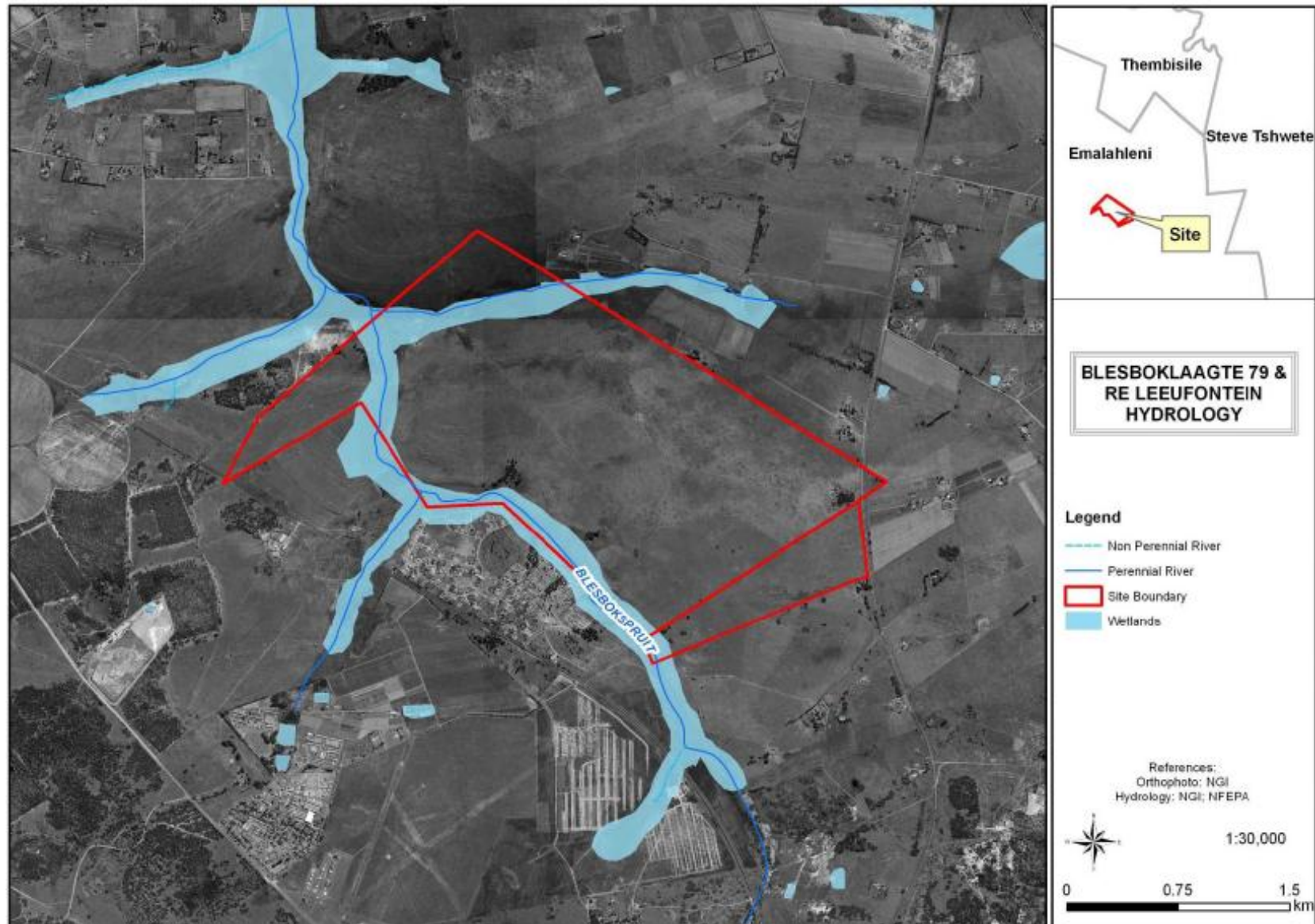


Figure 15: High level hydrology of the project site and surrounding areas

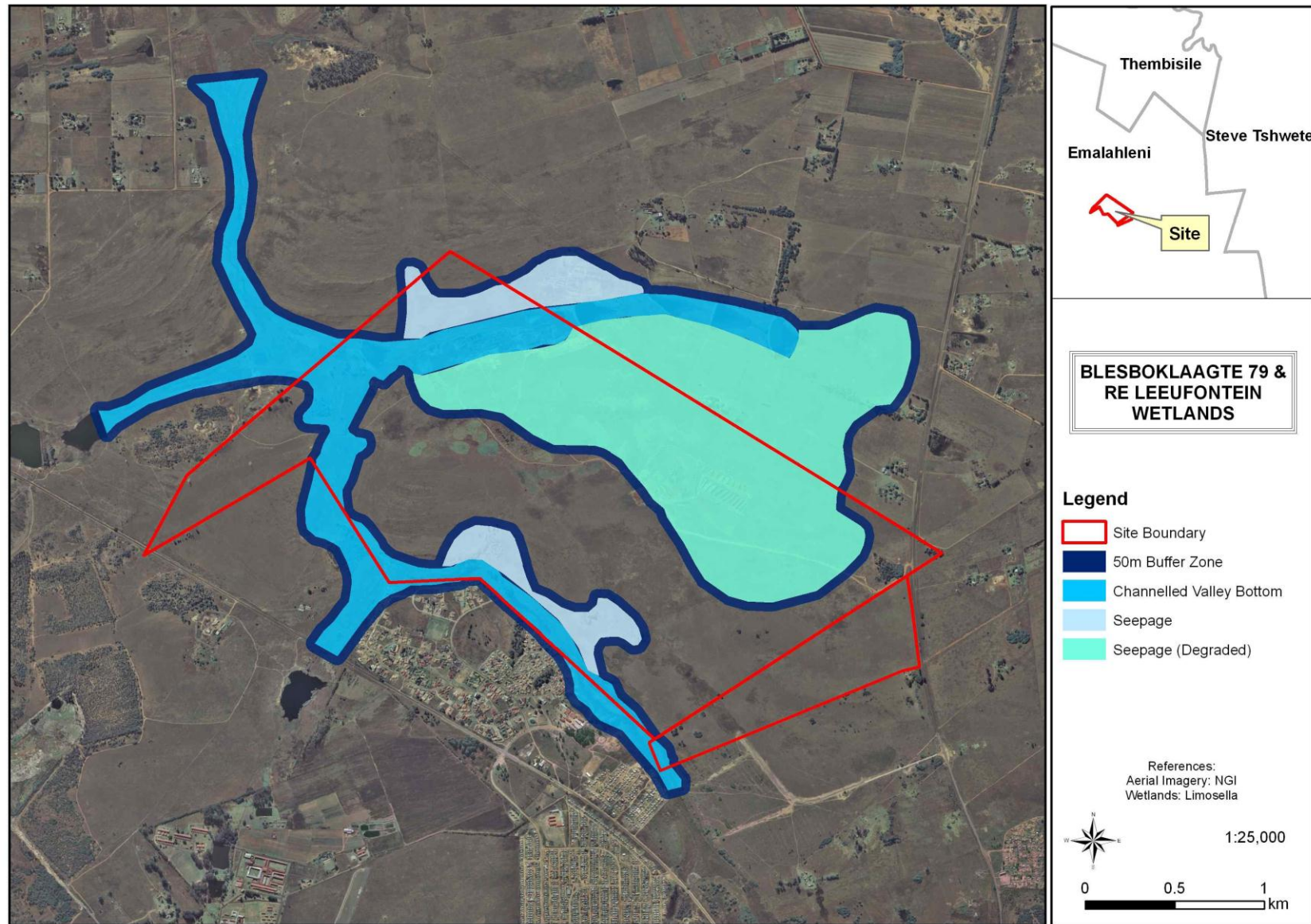


Figure 16: Wetlands associated with the project site (original assessment - 2014)

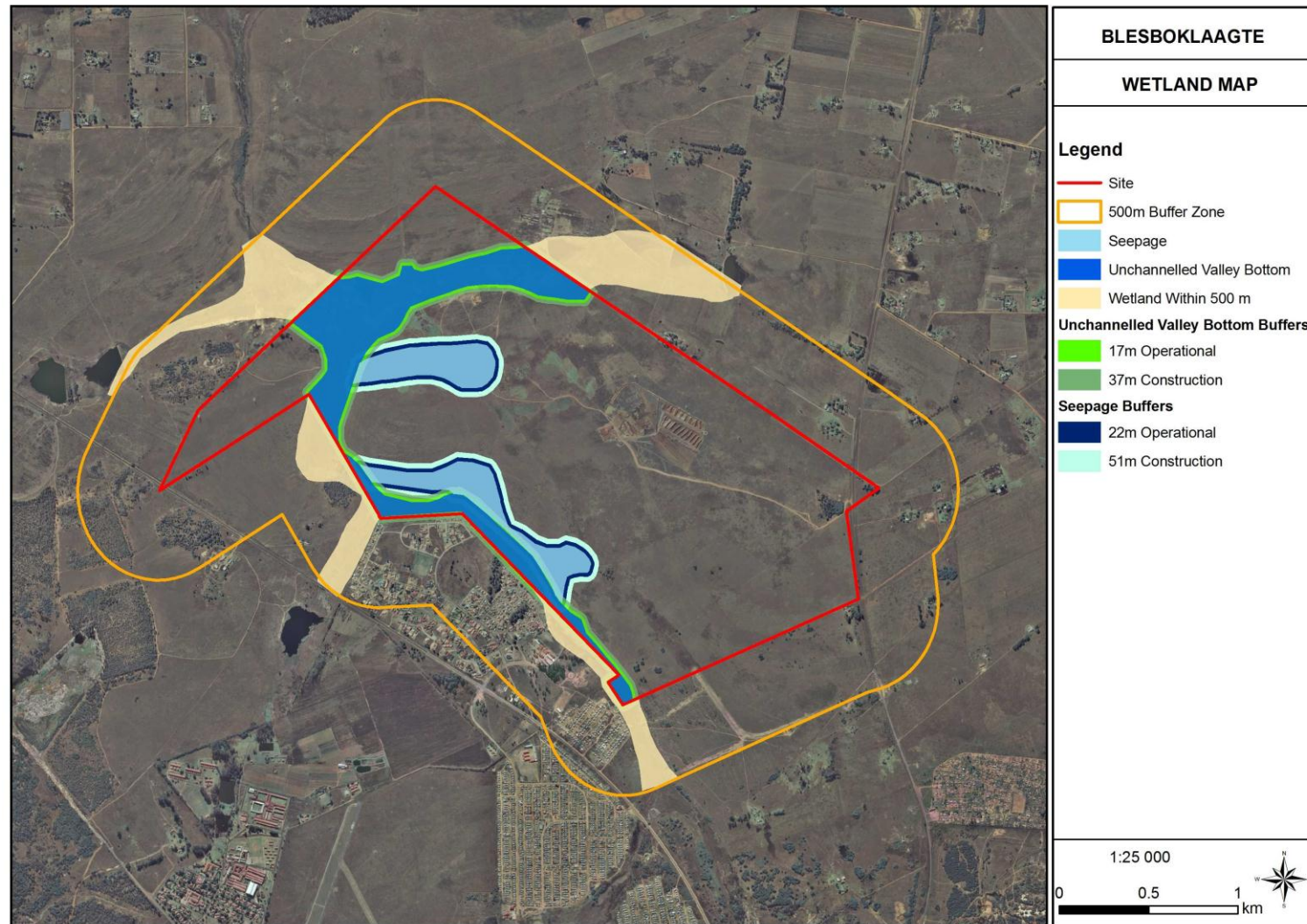


Figure 17: Wetlands associated with the project site (follow up assessment - 2018)

8.3.4 Social

The project site is situated within the Emalahleni Local Municipality. According to the 2011 Census, the municipality had a population of 395 466 people, distributed between 119 874 households. There were therefore 3.3 persons per household in 2011.

The age structure of the municipal area was as follows:

- <15 years of age: 25.2%;
- 15-64 years of age: 71.2%; and
- 65+ years of age: 3.6%.

The dependency ratio was 40.4 persons per 100 persons and there were 111.8 men per 100 women in 2011. The official employment rate was 27.3% and the youth unemployment rate (15-34 years of age) was 36% (Statistics South Africa, 2011).

8.3.5 Economic

According to the Emalahleni Annual Report 2016/2017, the primary sector (consisting of the mining sector and agricultural sector) contributed 42.8% to Gross Value Added, the secondary sector (consisting of manufacturing, electricity and construction sectors) contributed 24.7% and the tertiary sector (consisting of trade, transport, finance and community services sectors) contributed a total of 32.5%.

The Municipality has identified that despite a growing economy, it is dominated by the mining sector, and the broadening of the economy is needed. This includes exploring ways of growing and expanding agricultural and manufacturing sectors that have potential to contribute to increased job opportunities (<https://www.emalahleni.gov.za>).

8.3.6 Archaeological and Cultural Heritage

A Phase 1 Heritage Impact Assessment was conducted for the project site by APelser Archaeological Consulting (2014). The full report is attached under Appendix D.

There are no known Stone Age sites in close proximity to the study area, although rock paintings (associated with the Later Stone Age) are known south of Emalahleni (Witbank) near the confluence of the Olifants River and Rietspruit (Bergh 1999: 4-5). Heritage surveys have recorded few outstanding Stone Age sites, rock paintings and engravings in the Eastern Highveld - mainly as a result of limited extensive archaeological surveys. Stone tools have, however, been recorded around some of the pans that occur on the Eastern Highveld (Pistorius 2010: 16).

Four sites of recent historical age were identified during the assessment in the study area, of which one was a grave site, and the other three were related to farming. These are discussed below:

Site 1

A grave site, containing at least ten (10) graves was found on site. Some of the graves are stone packed, while most have formal cement headstones and grave dressing. The age of the gravestones, or the identities of the deceased, could not be determined as the inscriptions on the headstones are illegible.

- **GPS Location:** 25°48'46.8"S; 29°13'11.9"E
- **Cultural Significance:** High (graves always carry a High Significance Rating)
- **Heritage Significance:** Grade III: Other heritage resources of local importance and therefore worthy of conservation

- **Field Ratings:** Local Grade IIIB: Should be included in the heritage register and may be mitigated (high/medium significance).



Figure 18: Site 1 graves

Sites 2-4

All three sites relate to recent farming activity in the area. This includes foundations of a recent homestead on Site 2, probably belonging to farm labourers, stone packed remains of livestock enclosures on Site 3 and 4, as well as possible labourer homestead remains on Site 3. It is not clear whether Sites 3 and 4 fall within the direct development area. No further mitigation is necessary as these sites are only represented by foundations and by ephemeral and low stone walling, and are therefore not considered significant.

- **GPS Locations:** Site 2 - 25°48'31.2"S; 29°12'30.4"E; Site 3 - 25°48'12.1"S; 29°11'51.7"E; and Site 4 - 25°48'14.6"S; 29°11'50.1"E
- **Cultural Significance:** Low to Medium
 Low: A cultural object being found out of context, not being part of a site or without any related feature/structure in its surroundings.
 Medium: Any site, structure or feature being regarded less important due to a number of factors, such as date and frequency. Also any important object found out of context.
- **Heritage Significance:** None
- **Field Ratings:** General protection C (IV C): Phase 1 is seen as a sufficient recording of the existing structure and it may therefore be demolished (low significance)



Figure 19: Sites 2 cement and brick foundations

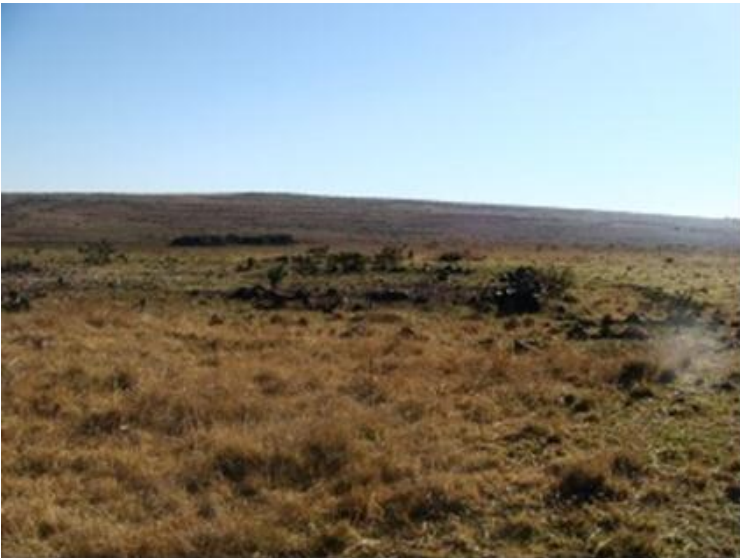


Figure 20: Site 3 stone wall foundations



Figure 21: Site 3 closer view of the possible homesteads



Figure 22: Site 4 stone wall – scarcely visible

8.3.7 Palaeontological Resources

A Desktop Palaeontological Impact Assessment was conducted for the project site by Dr H. Fourie (2015). The full report is attached under Appendix D.

The Karoo Supergroup, which is present on the site, is renowned for its fossil wealth. The Ecca Group is known for its coal (mainly the Vryheid Formation) (5 coal seams) and uranium. Coalfields formed due to the accumulation of plant material in shallow and large swampy deltas. The Dwyka Group is the lowermost unit of the Karoo Supergroup overlain by the Ecca Group and underlain by the Witteberg Group, Bokkeveld or Table Mountain Groups and various other groups. Fossils are found in the Dwyka Group. The Waterberg Group of rocks occur in several separate regions in the Limpopo and Mpumalanga Provinces. However, no fossils are found in the Waterberg group.

The Vryheid Formation is named after the area of Vryheid-Volksrust. In the north-eastern part of the basin, the Vryheid Formation thins and eventually wedges out towards the south, southwest and west with increasing distance from its source area. The Vryheid Formation consists essentially of sandstone, shale, and subordinate coal beds, and has a maximum total thickness of 500m. It forms part of the Middle Ecca. This formation has the largest coal reserves in South Africa. The prodelta sediments are characterised by trace and plants fossils.

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity can generally be **low to very high**, and here locally **low** for the Dwyka Group and **low** for the Waterberg Group.

Fossils likely to be found are mostly plants such as '*Glossopteris flora*' of the Vryheid Formation. The aquatic reptile *Mesosaurus* and fossil fish may also occur with marine invertebrates, arthropods and insects. Trace fossils can also be present. The marine bivalve *Megadesmus* is found in the upper part of the Volksrust Formation near Newcastle (Johnson, 2009).

Recommendation

a. There is no objection (see Recommendation b below) to the development and it may not be necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity is **LOW**. A Phase 2 Palaeontological Mitigation may be required if a Phase 1

Palaeontological Assessment identified a fossiliferous formation (e.g. Vryheid Formation). A Protocol for Finds is attached to this report (Appendix 1 of the Desktop Palaeontological Impact Assessment).

- b. This project will benefit the economy, the growth of the community and social development in general.
- c. Preferred choice: The impact on the palaeontological heritage is **LOW**. The presence of shale may be problematic. Care must be taken during the digging of foundations and when removing topsoil, subsoil and overburden.
- d. The following should be conserved: If any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.

Conclusion

- a. All the land involved in the development was assessed and none of the property is unsuitable for development (see Recommendation b above).
- b. All technical information required for the Desktop Palaeontological Impact Assessment was provided by the Consultant.
- c. Areas that would involve mitigation and may need a permit from the South African Heritage Resources Agency have been discussed (Dr H. Fourie, 2015).

9. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS (PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS THAT THE PROPOSED ACTIVITY AND ASSOCIATED STRUCTURES AND INFRASTRUCTURE WILL IMPOSE ON THE PREFERRED DEVELOPMENT FOOTPRINT)

9.1 Objectives of the EIA process

According to the Environmental Impact Assessment Regulations, 2014, the objective of the environmental impact assessment process is to, through a consultative process-

- (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.

9.2 Description of alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity

The alternatives that have been considered have been discussed under Section 8.1 of this report.

9.3 Description of the aspects that have been assessed as part of the EIA process

The following aspects will be assessed as part of the Environmental Impact Assessment process:

- Fauna and flora;
- Sensitive environments (wetlands);
- Aquatic;
- Surface and groundwater;
- Geology;
- Soils;
- Land use and land capability;
- Cultural and heritage resources;
- Palaeontological;
- Socio-economic; and
- Traffic.

9.4 Aspects assessed by specialists

The following specialist studies have been conducted and incorporated into the Environmental Impact Assessment Report for this project:

- Wetland/Riparian Delineation and Functional Assessment;
- Aquatic Assessment;
- Fauna Assessment;
- Vegetation Assessment;
- Phase 1 Heritage Impact Assessment;
- Desktop Palaeontological Impact Assessment;
- Soil, Land Capability and Land Use Assessment;
- Geotechnical Investigation; and
- Traffic Impact Study.

The specialist investigations covered the following aspects, and were conducted in line with the requirements of Appendix 6 of the Environmental Impact Assessment Regulations, 2014:

Wetland/Riparian Delineation and Functional Assessment

- To delineate the wetland/riparian areas;
- To classify the watercourse according to the system proposed in the national wetlands inventory, if relevant;
- To undertake an impact assessment as specified in the NEMA 2014 regulations
- To undertake a risk assessment as specified in General Notice 509 in published in the Government Gazette 40713 of 24 March 2017
- To recommend suitable buffer zones, both generic (as required in GDARD, 2014) and scientific (as specified in General Notice 267 of 24 March 2017, following Macfarlane *et al.* 2015);
- To undertake the functional assessment of wetlands and/or riparian areas within the project site; and
- To discuss potential impacts, mitigation and management procedures relevant to the conservation of wetland areas on the project site.

Aquatic Assessment

- To provide a literature review of the principles, methods, guidelines and criteria that are applicable to biomonitoring at Blesboklaagte and Leeuwpoot (Study Area);
- To determine the current aquatic health of the rivers in the vicinity of the study area using SASS5, IHAS, VEGRAI and FRAI methods at identified sampling points; and
- To report on the findings of the baseline biomonitoring survey conducted on the 8th of April 2014 at these sampling points.

Fauna Assessment

- To compile lists of the vertebrates that can be expected in the area;
- To assess the quantitative and qualitative condition of suitable habitat for the Red Listed vertebrates that may occur in the area;
- To identify the Red Data species that occur (or may occur);
- To express an opinion pertaining to the conservation status of Red Data species habitats;
- To identify and describe particular ecologically sensitive areas;
- To identify problem areas in need of special treatment or management, e.g. bush encroachment, erosion, water pollution, degraded areas, reclamation areas; and
- To make recommendations on aspects that should be monitored during and after development.

Vegetation Assessment

- To review of relevant literature;
- To undertake a field survey and assessment of the biophysical environment and current status of natural features on the proposed site and compare the findings to the expected natural state as listed in the national vegetation map;
- To undertake field surveys with specific reference to plants of conservation concern ("red data" and provincially protected species) that could occur within the study site or immediate surroundings;
- To undertake sensitivity mapping, including possible or confirmed localities of plants of conservation concern; and
- To report on the potential impacts that the proposed township could have on vegetation and recommend mitigation measures to limit or negate the potential negative impacts where possible.

Phase 1 Heritage Impact Assessment

- To identify all objects, sites, occurrences and structures of an archaeological or historical nature (cultural heritage sites) located on the project site (land that will be impacted upon by the proposed development);
- To assess the significance of the cultural resources in terms of their archaeological, historical, scientific, social, religious, aesthetic and tourism value;

- To describe the possible impact of the proposed development on these cultural remains, according to a standard set of conventions;
- To propose suitable mitigation measures to minimise possible negative impacts on the cultural resources; and
- To review applicable legislative requirements.

Desktop Palaeontological Impact Assessment

- To identify exposed and subsurface rock formations that are considered to be paleontologically significant;
- To assess the level of palaeontological significance of these formations;
- To comment on the impact of the development on these exposed and/or potential fossil resources; and
- To make recommendations as to how the developer should conserve or mitigate damage to these resources.

Soil, Land Capability and Land Use Assessment

- To conduct a detailed soil assessment of the remaining extent of the farm Leeuwpoort 283 JS and portion 79 of the farm Blesboklaagte 296 JS;
- To classify and map soil forms according to the South African Taxonomic Soil Classification System, 1991;
- To derive and map land capability based on soil properties;
- To identify soil properties related to wetness to enable the delineation of wetland or riparian zones based on guidelines of the Department of Water Affairs;
- To map all current land uses; and
- To determine all possible impacts by the proposed activities and provide associated mitigation measures.

Geotechnical Investigation

- To identify and evaluate any possible engineering geological problems before commencement of proper township proclamation.

Traffic Impact Study

- To quantify the expected traffic from the mixed used development;
- To determine the impact of the traffic generated by the proposed development on the immediate surrounding road network, with a view to quantify and propose road or intersection upgrades if necessary;
- To evaluate and propose appropriate access configuration(s) to the proposed development site; and
- To evaluate on the public transport services/facilities for the proposed development.

9.5 Description of the method of assessing the environmental aspects and impacts

Elements of the proposed development that can interact with the environment are deemed to be environmental aspects. These have been identified during the Environmental Impact Assessment, for each phase of the proposed development. Thereafter, the potential impacts that can result from the development's aspects were identified. The impacts, whether positive or negative, are defined as any change to the environment resulting from the identified environmental aspects.

Assessing the significance of the potential impacts has been conducted using the parameters below. Direct, indirect and cumulative impacts have been assessed.

The **nature** of the impact: This will include a qualitative description of what caused the impact and how it will affect the environment;

The **extent** of the impact: The size (physical/geographical) that will be affected by the impact. The following weighting will be used:

- Onsite: Weighting value **1**: The impact is confined to the project site/property
- Local: Weighting value **2**: The impact is confined to the project site/property and a 10km radius around the project site/property
- Regional: Weighting value **3**: The impact extends further than a 10km radius around the project site/property

The **duration** of the impact: The length of time over which the impact will persist. The following weighting will be used:

- Short term: Weighting value **1**: The impact will persist for up to one year
- Medium term: Weighting value **2**: The impact will persist for longer than one year, but shorter than five years
- Long term: Weighting value **3**: The impact will persist for longer than five years

The **magnitude** of the impact: The intensity of the impact on the environment. The following weighting will be used:

- Low: Weighting value **1**: Natural processes continue, albeit in an altered manner
- Medium: Weighting value **2**: Natural processes cease temporarily
- High: Weighting value **3**: Natural processes cease indefinitely

The **probability** of the impact: How likely it is that the impact will happen. The following weighting will be used:

- Improbable: Weighting value **1**: It is unlikely that the impact will occur
- Probable: Weighting value **2**: There is a chance that the impact will occur
- Definite: Weighting value **3**: The impact will most certainly occur

The **status** of the impact: This will include a qualitative description of the following:

- Whether the impact is **positive** or **negative** in nature
- The degree to which the impact can be reversed
- The degree to which the impact can be mitigated
- The degree to which the impact may cause irreplaceable loss of resources

The **significance** of the impact: This will be calculated using the formula below:

Significance = (Duration + Extent + Magnitude) x Probability

The significance of the impact will be divided into the following classes, based on the result of the above given equation:

- **Low Impact: Weighting value: 1-9**
- **Medium Impact: Weighting value: 10-18**
- **High Impact: Weighting value: 19-27**

The aspects to be assessed by specialists have been listed under Section 9.4. The impacts of the proposed project will be assessed by each specialist, mostly also using the following formula:

Significance = (Duration + Extent + Magnitude) x Probability

The specialist's impact assessments will be contained in each individual specialist report.

9.6 Environmental Impacts (Issues) and Risks identified during the Environmental Impact Assessment process

The following impacts and risks have been identified for the preferred alternative:

Wetlands

- Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows. The sources of this impacts include:
 - Compaction of soil;
 - Removal of vegetation;
 - Surface water redirection during construction activities;
 - Development within the wetland; and
 - Permanent changes to water flows during the operational phase are related to changes stormwater flows.
- Changing the amount of sediment entering water resource and associated change in turbidity (increasing or decreasing the amount). Possible sources of the impacts include:
 - Earthwork activities during construction;
 - Clearing of surface vegetation will expose the soils, which in rainy events would wash through the watercourse, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive trees can spread easily into these eroded soil;
 - Disturbance of soil surface;
 - Disturbance of slopes through the creation of roads and tracks adjacent to the watercourse; and
 - Erosion (e.g. gully formation, bank collapse).
- Introduction and spread of alien vegetation.
 - The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasions of alien plants can impact on hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alien invasive plants can spread through the catchment. If allowed to seed before control measures are implemented, alien plans can easily colonise and impact on downstream users.
- Loss and disturbance of watercourse habitat and fringe vegetation.
 - Direct development within watercourse areas, including crossings. Loss and disturbance of watercourse habitat and fringe vegetation due to direct development on the watercourse as well as changes in management, fire regime and habitat fragmentation.
- Changes in water quality due to pollution.
 - Construction and operational activities may result in the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ivers and a reduction in watercourse function as well as human and animal waste.

Aquatic Environment

- Increased surface water runoff due to hardened surfaces: During the upgrade of construction phase of the proposed housing development the use of heavy machinery, concrete foundations, compacted ground and impermeable surfaces will result in an increase in hardened surfaces. Hardened surfaces reduce infiltration rates and increase runoff volumes and velocities. The runoff from the construction activities is most likely to end up in one of the Blesbokspruit tributaries or directly into the Blesbokspruit itself. This can have impacts downstream where the increase in flow is concentrated; increase the risk of erosion and sedimentation; destroy riparian vegetation; and destabilise watercourses. A decrease in infiltration can also reduce natural recharge to the shallow and groundwater zones and subsequently may impact on the natural watercourses nearby.
- Increased erosion and sedimentation: Any bare soil resulting from the construction and associated vegetation clearing will be susceptible to erosion, especially during the rainy season. The increase in erosion and dust generation can result in increased sediment loads. Sedimentation will reduce the water quality, which can also affect aquatic life through the smothering of riverine habitat and fish gill clogging.
- Sewage spillages: Raw sewage will have a severe impact upon the water quality if it enters a river. The sewage contains elevated levels of nutrients (nitrates and phosphates), disease causing bacteria (in particular *E. coli*) and

large volumes of waste matter. This will make the water undrinkable. The large amount of waste matter will increase the turbidity and provide a habitat for bacteria to breed and feed on the suspended material. Increases the turbidity of the water will block out sunlight which is necessary for all forms of life to exist in the water. It also blocks the gills of aquatic organisms, making it difficult for them to breathe as well as hunt and catch food. The excess nutrients cause massive algal growth, which could result in eutrophication.

Surface and Groundwater

- Pollution of surface and/or groundwater resources due to the potential release of pollutants, such as chemicals, especially during the construction phase.
- Pollution of surface and/or groundwater resources due to the potential release of wastewater (sewage) during the operational phase.
- Pollution of surface and/or groundwater resources due to poor waste management.
- Pollution of surface and/or groundwater resources due to the incorrect management of chemical substances (fuels, oils etc.).
- Unsustainable utilisation of water.
- Pollution of surface and/or groundwater resources due to the runoff of contaminated stormwater.

Fauna

- Loss of exotic species, declared weeds and invader plants: It is recommended that noxious alien trees, particularly blue-gums, are eradicated before construction is commenced. However, inevitably, new gardens will be established by planting exotics. This may ecologically not be puritan, but can be expected to favour an increase of garden birds.
- Loss of ecological sensitive and important vegetation units: When expressed as vertebrate habitat, the wetlands and water bodies are deemed as sensitive and their integrity should not be jeopardized during the construction or operational phases. It is recommended that cattle grazing is contained from the stage when the project is formalised.
- Loss of ecosystem function (e.g. reduction in water quality, soil pollution): Storm water run-off from the hard-cover areas of the development could amount to significant volumes inundating the wetlands, unless contained. Unmanaged water masses and quality can be expected to harm the wetlands and streambeds.
- Loss of faunal habitat: The likelihood that the proposed development will displace the biological components of the plains and slopes is high, but the ecological impact of this loss is spatially and ecologically deemed as small.
- Loss/displacement of threatened or protected fauna: Few, if any, of the Red Data species still persisting on the terrestrial and rupicolous habitats will survive. These will be displaced in the face of the planned development. Such a loss will be the ultimate stage of a spiral decline of species richness commenced decades ago.

Flora

- Destruction of natural rocky vegetation, in particular the rocky ridge, and deterioration of rocky grassland, due to:
 - Clearing of vegetation for construction of the township as well as infrastructure;
 - Access roads;
 - Illegal disposal and dumping of construction material such as cement or oil during construction; and
 - Edge effects from construction.
- Construction activities on the rocky ridge, especially the area where these plants are concentrated: Destruction of plant species that are 'Declining', 'Rare' or provincially protected.
- Destruction of moist grassland and deterioration of the vegetation associated with moist grasslands: Clearing of the vegetation and change to water runoff patterns and soil hydrology; and the Deterioration of vegetation in moist grasslands due to edge effects, sedimentation, compaction or increased pollutants.
- Possible increase in exotic and invasive vegetation: Alien vegetation spreading from existing infestation into disturbed soils as well as the moist grasslands.

- Loss of the ecological function of the moist grasslands: Polluted water reaching the watercourses and moist grassland; and the lack of natural vegetation and the subsequent loss of the ecological function of the vegetation as catchment to the moist grassland and downstream watercourse.
- Deterioration of natural vegetation and eventual loss of rocky grassland: Edge effects from the development; and altered fire regime where natural fires are prevented.
- Possible increase in exotic and invasive vegetation: Alien vegetation spreading from existing infestation into disturbed soils as well as the wetland area; and Exotic plant species from gardens spreading to the rocky grasslands, moist grasslands and subsequently downstream.

Heritage Resources

Disturbance or destruction of cultural and heritage resources.

Paleontological Resources

- Construction and development activities resulting in a disturbance or destruction of palaeontological resources:
 - Earth moving equipment/machinery (front end loaders, excavators, graders, dozers); and
 - Sealing-in or destruction of fossils by development, vehicle traffic and human disturbance.

Air Quality and Noise

- Generation of dust.
- Release of vehicle emissions from construction vehicles.
- Generation of nuisance and noise.

Land Capability and Land Use

- Construction of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.: The current arable, grazing or wilderness land capability will cease completely until the structures are removed. The current land uses, such as grazing, will cease completely until the structures are removed (which is not foreseen).
- Possible contamination of soil by spillages of fuel or oil by mechanical equipment: The soil's physical and chemical properties will be adversely affected and will cause some reduction in land capability.
- Possible soil erosion at exposed building footprints due to higher runoff: Soil erosion will adversely affect land capability.
- Use and maintenance of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.: The pre-construction land capability at areas covered by concrete, tar or paving will remain ceased.

Soil

- The construction of structures that cover the soil surface by means of concrete, tar or paving:
 - Compaction of the soil surface for building foundations, parking areas etc. will alter the soil's physical properties negatively; and
 - Covering the soil surface with concrete, tar or paving will cause productive functioning of the soil to cease completely.
- Possible contamination of soil by spillages of fuel or oil by mechanical equipment with soil physical and chemical properties being adversely affected.
- Possible soil erosion at exposed building footprints due to higher runoff:
 - Possible soil erosion at exposed construction sites where the current natural vegetation was removed.
- Use and maintenance of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.:

- All impacts on soils during the construction phase will remain during the operational phase. The productive functioning of soil at areas covered by concrete, tar or paving will remain ceased.
- Soil pollution from the mixing of concrete.

Socio-economic

- Generation of a large number of job opportunities.
- Stimulation of the economy and housing sector.
- Potential increase in crime due to the influx of workers, especially during the construction phase.

Traffic

- Increase in traffic volumes to the site during both the construction and operational phases.

Cumulative Impacts

Wetlands

- Construction and operational activities may result in cumulative impact to the water courses within the local catchments and beyond. It is imperative that effective protective measures should be put into place and monitored. A rehabilitation plan should be put into action should any degradation be observed as a result from stormwater or sediment input. Increases in stormwater flows will definitely cause permanent degradation downstream unless mitigated at the design level.
- Changes in sediment entering and exiting the system: Cumulative impact is expected to be high. Should mitigation measure not be implemented sediment input may significantly alter the wetland and downstream watercourses. Reversing this process is unlikely and should be prevented in the first place.
- Alien vegetation: Regular monitoring should be implemented during construction, rehabilitation including for a period after rehabilitation is completed.
- Loss and disturbance of watercourse habitat and fringe vegetation: Cumulative impact is expected to be moderate. May result in a high degree of irreplaceable loss of resources.
- Changes in water quality due to pollution: Cumulative impact is expected to be moderate. Once in the system it may take many years for some toxins to be eradicated.

Flora

- Soil erosion may alter water flow rates, resulting in a cumulative impact on plants within wetland areas as well as downstream from the site.

9.7 Impact Assessment [Assessment of the significance of each impact (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]

The following tables discuss the impacts and risks identified for each alternative, including the nature, significance, consequences, extent, duration and probability of the impacts, including the degree to which the impacts can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed or mitigated, based on the information available at this stage of the process.

**Preferred Alternative
Wetlands**

Aspect	<ul style="list-style-type: none">• Compaction of soil;• Removal of vegetation;• Surface water redirection during construction activities;• Development within the wetland; and• Permanent changes to water flows during the operational phase are related to changes in stormwater flows.	
Impact and Nature	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows.	
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Construction Phase		
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	High	Low
Operational Phase		
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	High	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	High degree	
Aspect	<ul style="list-style-type: none">• Earthwork activities during construction;• Clearing of surface vegetation will expose the soils, which in rainy events would wash through the watercourse, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive trees can spread easily into these eroded soil;• Disturbance of soil surface;• Disturbance of slopes through the creation of roads and tracks adjacent to the watercourse; and• Erosion (e.g. gully formation, bank collapse).	
Impact and Nature	Changing the amount of sediment entering water resource and associated change in turbidity (increasing or decreasing the amount).	
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation

Operational Phase)		
Construction Phase		
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Medium	Low
Operational Phase		
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	Medium	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasions of alien plants can impact on hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alien invasive plants can spread through the catchment. If allowed to seed before control measures are implemented, alien plans can easily colonise and impact on downstream users.	
Impact and Nature	Introduction and spread of alien vegetation.	
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Construction Phase		
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Medium	Low
Operational Phase		
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	Medium	Low
Consequence	Negative	
Status of Impact		

Degree to which impact can be reversed	Medium degree
Degree to which impact may cause irreplaceable loss of resources	Low degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Aspect	Direct development within watercourse areas, including crossings.	
Impact and Nature	Loss and disturbance of watercourse habitat and fringe vegetation due to direct development on the watercourse as well as changes in management, fire regime and habitat fragmentation.	
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation

Construction Phase

Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Low	Low

Operational Phase

Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	Low	Low
Consequence	Negative	

Status of Impact

Degree to which impact can be reversed	Medium degree
Degree to which impact may cause irreplaceable loss of resources	Low degree
Degree to which impact can be avoided, managed or mitigated	High degree

Aspect	Construction and operational activities may result in the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/river and a reduction in watercourse function as well as human and animal waste.	
Impact and Nature	Changes in water quality due to pollution.	
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation

Construction Phase

Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		

Significance (Construction Phase)	Medium	Low
Operational Phase		
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	Medium	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Low degree	
Degree to which impact can be avoided, managed or mitigated	High degree	

Aquatic Environment		
Aspect	Increased surface water runoff due to hardened surfaces.	
Impact and Nature	Increase in flow is concentrated; increase the risk of erosion and sedimentation; destroy riparian vegetation; and destabilise watercourses. A decrease in infiltration can also reduce natural recharge to the shallow and groundwater zones and subsequently may impact on the natural watercourses nearby.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	2	1
Duration	3	3
Magnitude	2	1
Probability	3	3
Significance (Construction Phase)	21 - High	15 - Medium
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	Increased erosion and sedimentation.	
Impact and Nature	The increase in erosion and dust generation can result in increased sediment loads. Sedimentation will reduce the water quality which can also affect aquatic life through the smothering of riverine habitat and fish gill clogging.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	3	2
Duration	2	2
Magnitude	2	2
Probability	3	2
Significance (Construction Phase)	21 - High	12 - Medium
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	Sewage spillages.	
Impact and Nature	Raw sewage will have a severe impact upon the water quality if it enters a	

	river. The large amount of waste matter will increase the turbidity and provide a habitat for bacteria to breed and feed on the suspended material. Increases the turbidity of the water will block out sunlight which is necessary for all forms of life to exist in the water. It also blocks the gills of aquatic organisms, making it difficult to for them to breathe as well as hunt and catch food. The excess nutrients cause massive algal growth, which could result in eutrophication.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	2	2
Duration	2	2
Magnitude	3	2
Probability	3	2
Significance (Construction Phase)	21 - High	12 - Medium
Operational Phase		
Extent	2	1
Duration	3	2
Magnitude	2	1
Probability	2	1
Significance (Operational Phase)	14 - Medium	4 - Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	High degree	

Surface and Groundwater		
Aspect	Construction and operational activities.	
Impact and Nature	Pollution of surface and/or groundwater resources due to the release of pollutants, such as chemicals, especially during the construction phase.	
Construction Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	2	2
Duration	2	2
Magnitude	3	2
Probability	3	2
Significance (Construction Phase)	21 - High	12 - Medium
Operational Phase		
Extent	2	2
Duration	2	2
Magnitude	3	1
Probability	3	2
Significance (Operational Phase)	21 - High	10 - Medium
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	Operational activities.	
Impact and Nature	Pollution of surface and/or groundwater resources due to the potential release of wastewater (sewage) during the operational phase.	
Operational Phase		
Impact Rating (Operational Phase)	Before Mitigation	After Mitigation
Extent	2	2
Duration	2	1
Magnitude	2	2
Probability	2	1
Significance (Operational Phase)	12 - Medium	5 - Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	High degree	

Aspect	Construction and operational activities.	
Impact and Nature	Pollution of surface and/or groundwater resources due to poor waste management.	
Construction Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	2	2
Duration	2	1
Magnitude	3	2
Probability	2	1
Significance (Construction Phase)	14 - Medium	5 - Low
Operational Phase		
Extent	2	2
Duration	2	1
Magnitude	2	1
Probability	2	1
Significance (Operational Phase)	12 - Medium	4 - Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	

Aspect	Construction and operational activities.	
Impact and Nature	Pollution of surface and/or groundwater resources due to the incorrect management of chemical substances (fuels, oils etc.).	
Construction Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	2	2
Duration	2	1
Magnitude	3	3
Probability	2	1
Significance (Construction Phase)	14 - Medium	6 - Low
Operational Phase		
Extent	2	2
Duration	2	1
Magnitude	2	2
Probability	2	1
Significance (Operational Phase)	12 - Medium	5 - Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	

Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Aspect	Operational activities.
Impact and Nature	Unsustainable utilisation of water.

Operational Phase		
Impact Rating (Operational Phase)	Before Mitigation	After Mitigation
Extent	3	3
Duration	2	1
Magnitude	2	1
Probability	2	1
Significance (Operational Phase)	14 - Medium	5 - Low
Consequence	Negative	

Status of Impact	
Degree to which impact can be reversed	Low degree
Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	High degree

Aspect	Runoff of contaminated stormwater.
Impact and Nature	Pollution of surface and/or groundwater resources.

Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	3	2
Duration	2	2
Magnitude	2	2
Probability	3	1
Significance (Construction Phase)	21 - High	6 - Low
Consequence	Negative	

Status of Impact	
Degree to which impact can be reversed	Low degree
Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Fauna		
Aspect	Loss of exotic species, declared weeds and invader plants.	
Impact and Nature	It is recommended that noxious alien trees, particularly blue-gums, are eradicated before construction is commenced. However, inevitably, new gardens will be established by planting exotics. This may ecologically not be puritan, but can be expected to favour an increase of garden birds.	
Construction and Operational Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction and Operational Phase)	Positive impact (Low)	No mitigation required – positive impact (Low)
Consequence	Positive	
Status of Impact		
Degree to which impact can be reversed	N/A – positive impact	
Degree to which impact may cause irreplaceable loss of resources	N/A – positive impact	
Degree to which impact can be avoided, managed or mitigated	N/A – positive impact	
Aspect	Loss of ecological sensitive and important vegetation units (wetlands).	
Impact and Nature	When expressed as vertebrate habitat, the wetlands and water bodies are deemed as sensitive and their integrity are not to be jeopardized during the construction or operational phases. It is recommended that cattle grazing is contained from the stage when the project is formalised.	
Construction and Operational Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	
Duration		
Magnitude		
Probability		
Significance (Construction and Operational Phase)	High	Medium
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	

Aspect	Loss of ecosystem function (e.g. reduction in water quality, soil pollution).
Impact and Nature	Storm water run-off from the hard-cover areas of the development could amount to significant volumes inundating the wetlands, unless contained. Unmanaged water masses and quality can be expected to harm the wetlands and streambeds.

Construction and Operational Phase

Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	
Duration		
Magnitude		
Probability		
Significance (Construction and Operational Phase)	High	Medium
Consequence	Negative	

Status of Impact

Degree to which impact can be reversed	Low degree
Degree to which impact may cause irreplaceable loss of resources	High degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Aspect	Loss of faunal habitat.
Impact and Nature	The likelihood that the proposed development will displace the biological components of the plains and slopes is high, but the ecological impact of this loss is spatially and ecologically is deemed as small.

Construction and Operational Phase

Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	
Duration		
Magnitude		
Probability		
Significance (Construction and Operational Phase)	Medium	Low
Consequence	Negative	

Status of Impact

Degree to which impact can be reversed	Medium degree
Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Aspect	Loss/displacement of threatened or protected fauna.
Impact and Nature	Few, if any, of the Red Data species still persisting on the terrestrial and

	rupicolous habitats will survive. These will be displaced in the face of the planned development. Such a loss will be the ultimate stage of a spiral decline of species richness commenced decades ago.	
Construction and Operational Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	
Duration		
Magnitude		
Probability		
Significance (Construction and Operational Phase)	Medium	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	

Flora		
Aspect	Destruction of natural rocky vegetation, in particular the rocky ridge, and deterioration of rocky grassland.	
Impact and Nature	<ul style="list-style-type: none">• Clearing of vegetation for construction of the township as well as infrastructure;• Access roads;• Illegal disposal and dumping of construction material such as cement or oil during construction; and• Edge effects from construction	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	High	Medium to Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	Construction activities on the rocky ridge, especially the area where these plants are concentrated.	
Impact and Nature	Destruction of plant species that are ‘Declining’, ‘Rare’ or ‘provincially protected’.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	High	Medium to Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	Destruction of moist grassland and deterioration of the vegetation	

	associated with moist grasslands.	
Impact and Nature	Clearing of the vegetation and change to water runoff patterns and soil hydrology; and the Deterioration of vegetation in moist grasslands due to edge effects, sedimentation, compaction or increased pollutants.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	High	Medium
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	Possible increase in exotic and invasive vegetation.	
Impact and Nature	Alien vegetation spreading from existing infestation into disturbed soils as well as the moist grasslands.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Medium	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	High degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	High degree	
Aspect	Loss of the ecological function of the moist grasslands.	
Impact and Nature	Polluted water reaching the watercourses and moist grassland; and the lack of natural vegetation and the subsequent loss of the ecological function of the vegetation as catchment to the moist grassland and downstream watercourse.	
Operational Phase		
Impact Rating (Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report	Rating as provided in specialist

Duration	and methodology	report and methodology
Magnitude		
Probability		
Significance (Operational Phase)	High	Medium
Consequence	Negative	

Status of Impact

Degree to which impact can be reversed	Low degree
Degree to which impact may cause irreplaceable loss of resources	High degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Aspect	Deterioration of natural vegetation and eventual loss of rocky grassland
Impact and Nature	Edge effects from the development; and altered fire regime where natural fires are prevented.

Operational Phase

Impact Rating (Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	Medium	Low
Consequence	Negative	

Status of Impact

Degree to which impact can be reversed	Medium degree
Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Aspect	Possible increase in exotic and invasive vegetation.
Impact and Nature	Alien vegetation spreading from existing infestation into disturbed soils as well as the wetland area; and exotic plant species from gardens spreading to the rocky grasslands, moist grasslands and subsequently downstream.

Operational Phase

Impact Rating (Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	Medium	Low
Consequence	Negative	

Status of Impact

Degree to which impact can be reversed	High degree
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Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	High degree

Heritage Resources		
Aspect	Construction and operational activities.	
Impact and Nature	Disturbance or destruction of cultural and heritage resources – Site 1 (Graves).	
Construction and Operational Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	
Duration		
Magnitude		
Probability		
Significance (Construction and Operational Phase)	High	Medium
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Paleontological Resources		
Aspect	Construction and development activities resulting in a disturbance or destruction of palaeontological resources.	
Impact and Nature	<ul style="list-style-type: none">Earth moving equipment/machinery (front end loaders, excavators, graders, dozers) during construction; andSealing-in or destruction of fossils by development, vehicle traffic, and human disturbance.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Low	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	

Air Quality and Noise		
Aspect	Construction activities.	
Impact and Nature	Generation of dust.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	2	1
Duration	2	2
Magnitude	2	1
Probability	3	2
Significance (Construction Phase)	18 - Medium	8 - Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Low degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	Construction activities.	
Impact and Nature	Release of vehicle emissions from construction vehicles.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	3	3
Duration	3	3
Magnitude	1	1
Probability	3	2
Significance (Construction Phase)	21 - High	14 - Medium
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	Low degree	
Aspect	Construction activities.	
Impact and Nature	Generation of nuisance and noise.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	2	1
Duration	2	2
Magnitude	2	1
Probability	3	2
Significance (Construction Phase)	18 - Medium	8 - Low

Consequence	Negative
Status of Impact	
Degree to which impact can be reversed	Low degree
Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Land Capability and Land Use		
Aspect	Construction of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.	
Impact and Nature	<ul style="list-style-type: none">The current arable, grazing or wilderness land capability will cease completely until the structures are removed.The current land uses such as grazing will cease completely until the structures are removed (which is not foreseen).	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	High	High
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Low degree	
Aspect	Possible contamination of soil by spillages of fuel or oil by mechanical equipment.	
Impact and Nature	Soil physical and chemical properties will be adversely affected and will cause some reduction in land capability and land use.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Medium	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	

Aspect	Possible soil erosion at exposed building footprints due to higher runoff.	
Impact and Nature	Soil erosion will adversely affect land capability and land use.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Medium	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	
Aspect	Use and maintenance of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.	
Impact and Nature	The pre-construction land capability and land use at areas covered by concrete, tar or paving will remain ceased.	
Operational Phase		
Impact Rating (Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	High	High
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Low degree	

Soils		
Aspect	The construction of structures that cover the soil surface by means of concrete, tar or paving.	
Impact and Nature	<ul style="list-style-type: none">• Compaction of the soil surface for building foundations, parking areas etc. will alter the soil's physical properties negatively; and• Covering the soil surface with concrete, tar or paving will cause productive functioning of the soil to cease completely.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	High	High
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Low degree	
Degree to which impact may cause irreplaceable loss of resources	High degree	
Degree to which impact can be avoided, managed or mitigated	Low degree	
Aspect	Possible contamination of soil by spillages of fuel or oil by mechanical equipment	
Impact and Nature	Possible contamination of soils by spillages of fuel or oil by mechanical equipment. Soil physical and chemical properties will be adversely affected.	
Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Medium	Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	Medium degree	

Aspect	Possible soil erosion at exposed building footprints due to higher runoff.
Impact and Nature	Possible soil erosion at exposed construction sites where the current natural vegetation were removed.

Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Construction Phase)	Medium	Low
Consequence	Negative	

Status of Impact	
Degree to which impact can be reversed	Medium degree
Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Aspect	Use and maintenance of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.
Impact and Nature	All impacts on soils during the construction phase will remain during the operational phase. The productive functioning of soil at areas covered by concrete, tar or paving will remain ceased.

Construction Phase		
Impact Rating (Operational Phase)	Before Mitigation	After Mitigation
Extent	Rating as provided in specialist report and methodology	Rating as provided in specialist report and methodology
Duration		
Magnitude		
Probability		
Significance (Operational Phase)	High	High
Consequence	Negative	

Status of Impact	
Degree to which impact can be reversed	Low degree
Degree to which impact may cause irreplaceable loss of resources	High degree
Degree to which impact can be avoided, managed or mitigated	Low degree

Aspect	The mixing of concrete.
Impact and Nature	Soil pollution.

Construction Phase		
Impact Rating (Construction Phase)	Before Mitigation	After Mitigation
Extent	2	1
Duration	2	2
Magnitude	2	2

Probability	2	1
Significance (Construction Phase)	12 - Medium	5 - Low
Consequence	Negative	
Status of Impact		
Degree to which impact can be reversed	Medium degree	
Degree to which impact may cause irreplaceable loss of resources	Medium degree	
Degree to which impact can be avoided, managed or mitigated	High degree	

Socio-economic		
Aspect	Construction and operational activities.	
Impact and Nature	Generation of a large number of job opportunities.	
Construction and Operational Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	N/A – Positive impact	N/A – Positive impact
Duration		
Magnitude		
Probability		
Significance (Construction and Operational Phase)	Positive impact	No mitigation required – positive impact
Consequence	Positive	
Status of Impact		
Degree to which impact can be reversed	N/A – positive impact	
Degree to which impact may cause irreplaceable loss of resources	N/A – positive impact	
Degree to which impact can be avoided, managed or mitigated	N/A – positive impact	
Aspect	Construction and operational activities.	
Impact and Nature	Stimulation of the economy and housing sector.	
Construction and Operational Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	N/A – Positive impact	N/A – Positive impact
Duration		
Magnitude		
Probability		
Significance (Construction and Operational Phase)	Positive impact	No mitigation required – positive impact
Consequence	Positive	
Status of Impact		
Degree to which impact can be reversed	N/A – positive impact	
Degree to which impact may cause irreplaceable loss of resources	N/A – positive impact	
Degree to which impact can be avoided, managed or mitigated	N/A – positive impact	
Aspect	Construction and operational activities.	
Impact and Nature	Potential increase in crime due to the influx of workers, especially during the construction phase.	
Construction and Operational Phase		
Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation

Extent	2	2
Duration	2	2
Magnitude	2	1
Probability	2	1
Significance (Construction and Operational Phase)	12 - Medium	5 - Low
Consequence	Negative	

Status of Impact

Degree to which impact can be reversed	Low degree
Degree to which impact may cause irreplaceable loss of resources	High degree
Degree to which impact can be avoided, managed or mitigated	Medium degree

Traffic

Aspect	Construction and operational activities.
Impact and Nature	Increase in traffic volumes to the site during both the construction and operational phases.

Construction and Operational Phase

Impact Rating (Construction and Operational Phase)	Before Mitigation	After Mitigation
Extent	2	2
Duration	2	2
Magnitude	2	2
Probability	3	3
Significance (Construction and Operational Phase)	18 - Medium	18 - Medium
Consequence	Negative	

Status of Impact

Degree to which impact can be reversed	Low degree
Degree to which impact may cause irreplaceable loss of resources	Medium degree
Degree to which impact can be avoided, managed or mitigated	Low degree

No-Go Option

The No-Go Option would be where the project site is not developed and remains as vacant- and grazing- land. The No-Go Option is not considered to be a reasonable alternative as this would mean that the land is under-utilised in terms of its potential for a mixed use development and in particular, to reduce pressure on the Municipality in terms of the housing backlog. The project site is situated within areas earmarked as Urban Settlement Growth Areas and Strategic Development Areas according to the Emalahleni Spatial Development Framework and the No-Go option would therefore also not be in line with the spatial planning objectives of the municipality.

9.8 Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives

Please refer to Section 9.5 of this report.

9.9 Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected

As detailed under Sections 9.6 and 9.7 above.

9.10 Possible mitigation measures that could be applied and level of residual risk

Detailed mitigation measures have also been included in the Environmental Management Programme (EMPr) that forms part of this Environmental Impact Assessment Report. The following table contains possible mitigation measures (as identified in the Scoping Phase and upon which the mitigation measures have been elaborated in the EMPr).

Impact	Possible mitigation measures
Wetlands	
Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows.	<ul style="list-style-type: none"> • Effective stormwater management should be a priority during both construction and operational phase. This should be monitored as part of the EMP. • An environmentally friendly stormwater design should be formulated based on empirical data showing how a neutral effect on the regional hydrograph will be achieved. • High energy stormwater input into the watercourses should be prevented at all cost. Changes to natural flow of water (surface water as well as water flowing within the soil profile) should be taken into account during the design phase and mitigated effectively. • Implement the principles set out in The South African Guidelines for Sustainable Drainage Systems (SuDS) (Armitage <i>et al.</i>, 2013). • Monitoring for local and downstream impacts during the construction as well as operational phases are imperative and should form part of the EMP.
Changing the amount of sediment entering water resource and associated change in turbidity (increasing or decreasing the amount).	<ul style="list-style-type: none"> • Avoid construction related activities in the delineated wetlands and their buffer zones. • Consider the various methods and equipment available and select whichever method(s) that will have the least impact on watercourses. • Water may seep into trenching and earthworks. It is likely that water will be contaminated within these earthworks and should therefore be cleaned or dissipated into a structure that allows for additional sediment input and slows down the velocity of the water, thereby reducing the risk of erosion. Effective sediment traps should be installed. • Construction in and around watercourses must be restricted to the dryer winter months, where possible. • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/earthworks in that area

Impact	Possible mitigation measures
	<p>(DWAF, 2005).</p> <ul style="list-style-type: none"> • Remove only the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover. • Rehabilitation plans must be submitted and approved for rehabilitation of damage during construction and that plan must be implemented immediately upon completion of construction. • Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access. • During the construction phase, measures must be put in place to control the flow of excess water so that it does not impact on the surface vegetation. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • Runoff from the construction area must be managed to avoid erosion and pollution problems. • Maintain buffer zones to trap sediments. • Monitoring should be done to ensure that sediment pollution is timeously addressed.
Introduction and spread of alien vegetation.	<ul style="list-style-type: none"> • Implement an Alien Plant Control Plan. • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/earthworks in that area and returning it where possible afterwards. • Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish. • Rehabilitate or revegetate disturbed areas.
Loss and disturbance of watercourse habitat and fringe vegetation.	<ul style="list-style-type: none"> • No development should occur within the delineated wetland and buffer zones. • Demarcate the watercourse areas and buffer zones to limit disturbance; clearly mark these areas as no-go areas. • Weed control in buffer zone should be implemented. • Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed. • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish. • Operational activities should not take place within watercourses or buffer zones, nor should edge effects impact on these areas. • Operational activities should not impact on rehabilitated or naturally vegetated areas.
Changes in water quality due to pollution.	<ul style="list-style-type: none"> • Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone.

Impact	Possible mitigation measures
	<ul style="list-style-type: none"> • Implementation of appropriate stormwater management around the excavation to prevent the ingress of run-off into the excavation and to prevent contaminated runoff into the watercourse. • The development footprint must be fenced off from the watercourses and no related impacts may be allowed into the watercourse e.g. water runoff from cleaning of equipment, vehicle access etc. • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land shall be left in a condition as close as possible to that prior to use. • Maintenance of construction vehicles/equipment should not take place within the watercourse or watercourse buffer. • Maintenance of buffer zones to trap sediments with associated toxins. • Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects. • Control of waste discharges and do not allow dirty water from operational activities to enter the watercourse. • Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects and failure of infrastructure, such as sewerage pipes. Implement litter traps at all watercourse crossings. • Treatment of identified pollution should be prioritized accordingly.
Aquatic Environment	
Increased surface water runoff due to hardened surfaces.	<ul style="list-style-type: none"> • All areas, not directly within the footprint of the development, where soil has been compacted, should be ripped to break up the compacted soil surface. This will aid infiltration and decrease runoff. • Re-vegetation should take place immediately according to the re-vegetation plan. The species utilised for re-vegetation should be endemic to the area and not include any alien or invasive species. These areas should be monitored to ensure the successful re-establishment of vegetation and to ensure that no erosion gullies form. • All water systems should be sited, designed and operated to restrict the possibility of damage to the riparian or in-stream habitat.
Increased erosion and sedimentation.	<ul style="list-style-type: none"> • Initiate catchment management to control and reduce erosive runoff containing suspended sediment. • Minimise the potential sources of sediment (small particles) from the outset. This means limiting the extent (area) and duration (time period) of land and vegetation disturbance to the minimum needed, and protecting surfaces once they are exposed. This minimises the potential for storm water disturbances and reduces the sediment loads to receiving streams. • Where site disturbance is significant and unavoidable, undertake proper storm water management planning in accordance with the DWA's Best Practice Guideline documents. • Retain sediments that are picked up on the project site through the use of sediment-capturing devices. On most sites successful erosion and sedimentation control requires a combination of structural

Impact	Possible mitigation measures
	<p>(building required) and vegetative (planting required) practices.</p> <ul style="list-style-type: none"> • Immediate re-vegetation of all bare soil areas should be undertaken. The species utilised for re-vegetation should be endemic to the area and not include any alien or invasive species. These areas should be monitored to ensure the successful re-establishment of vegetation and to ensure that no erosion gullies form. • The design of water management facilities should include suitable erosion protection measures to ensure that downstream erosion or sedimentation is minimised. • Do not allow loose soil removed to wash away or blow away – keep covered and place in a secure location. • Access roads to the reed bed system, if any, should be regularly maintained and the roads should have an acceptable surface, be free from erosion damage and have effective drainage, preventing the impounding/ponding of water. • Water quality should be monitored regularly according to the monitoring program and appropriate and timeous remedial interventions made in the case of non-compliance.
Sewage spillages.	<ul style="list-style-type: none"> • Proper planning and design should take place prior to construction to avoid sewage spillages. • Development should always be constructed outside of the 1:100 year flood line of the Blesbokspruit or outside of the buffer created for the wetland, whichever is larger.
Surface and Groundwater	
Pollution of surface and/or groundwater resources due to the potential release of pollutants, such as chemicals, especially during the construction phase.	<ul style="list-style-type: none"> • No wastewater or wash water may be released into the environment from construction activities. • Vehicles should regularly be inspected to ensure that any fuel or oil leaks are repaired. • Spill kits must be onsite to clean up any hydrocarbon spillages.
Pollution of surface and/or groundwater resources due to the potential release of wastewater (sewage) during the operational phase.	<ul style="list-style-type: none"> • All wastewater (sewage) must be collected in appropriate holding/conservancy tanks and may not come into contact with the environment prior to treatment thereof.
Pollution of surface and/or groundwater resources due to poor waste management.	<ul style="list-style-type: none"> • Waste must be managed according to its hazard classification (i.e. general vs hazardous waste) and general and hazardous waste streams should not be mixed. • Waste stored onsite must be kept in appropriate containers with lids that can be closed. • Waste must be taken to appropriately licensed facilities for reuse, recycling, recovery or disposal. • No waste may be stored on open soil or within wetlands and/or watercourses.
Pollution of surface and/or groundwater resources due to the incorrect management of chemical substances and dangerous goods (oils, fuels etc.)	<ul style="list-style-type: none"> • Drip trays must be readily available onsite and used for any repair work, maintenance work or refuelling undertaken onsite. • Spill kits must be readily available onsite and personnel must be trained on the appropriate procedures to clean hydrocarbon spillages.

Impact	Possible mitigation measures
Unsustainable utilisation of water.	<ul style="list-style-type: none"> Regularly inspect reservoirs, water pipes, JoJo tanks and taps for leakages and repair where necessary.
Pollution of surface and/or groundwater resources due to the runoff of contaminated stormwater.	<ul style="list-style-type: none"> Storm water must be diverted around areas where there are pollution sources. Storm water drainage infrastructure must be regularly inspected for obstructions. No contaminated storm water may be released into the environment from the construction activities. Washing or cleaning of equipment and machinery must occur in a designated area and the contaminated wash water must be contained. Such an area could be a plastic drum, a leak-proof container or a plastic lined pit.
Fauna	
Loss of exotic species, declared weeds and invader plants.	<ul style="list-style-type: none"> It is recommended that noxious alien trees, particularly blue-gums, are eradicated before construction is commenced. However, inevitably, new gardens will be established by planting exotics. This may ecologically not be puritan, but can be expected to favour an increase of garden birds.
Loss of ecological sensitive and important vegetation units.	<ul style="list-style-type: none"> The area cleared for the proposed project must be kept to a minimum. Cattle grazing must be contained from the stage when the project is formalised. All areas designated as sensitive in a sensitivity mapping exercise should be incorporated into an open space system. The open space system should be managed in accordance with an Ecological Management Plan that complies with the Minimum Requirements for Ecological Management Plans and forms part of the EMP. The open space system should be fenced off prior to construction commencing.
Loss of ecosystem function (e.g. reduction in water quality, soil pollution).	<ul style="list-style-type: none"> Total sealing of paved areas such as parking lots, driveways, pavements and walkways should be avoided. Permeable material should rather be utilised for these purposes. The crossing of natural drainage systems should be minimized and only constructed at the shortest possible route, perpendicular to the natural drainage system. Where possible, bridge crossings should span the entire stretch of the buffer zone.
Loss of faunal habitat.	<ul style="list-style-type: none"> The area cleared for the proposed project must be kept to a minimum. Cattle grazing must be contained from the stage when the project is formalised. All areas designated as sensitive in a sensitivity mapping exercise should be incorporated into an open space system. The open space system should be managed in accordance with an Ecological Management Plan that complies with the Minimum Requirements for Ecological Management Plans and forms part of the EMP.

Impact	Possible mitigation measures
Loss/displacement of threatened or protected fauna.	<ul style="list-style-type: none"> The open space system should be fenced off prior to construction commencing. Natural migration of fauna species should not be hampered and the protection of fauna species should be promoted (i.e. fauna species should not be harmed or killed). All outside lighting should be directed away from sensitive areas. Fluorescent and mercury vapour lighting should be avoided and sodium vapour (yellow) lights should be used wherever possible. All storm water structures should be designed so as to block amphibian and reptile access to the road surface.
Flora	
Destruction of natural rock grassland vegetation.	<ul style="list-style-type: none"> An independent Ecological Control Officer (ECO) should be appointed to oversee construction activities. The construction footprint should incorporate as much rocky grassland as possible into open space planning; especially the area marked as high sensitivity, which contains the highest concentration of plants of conservation concern. A permanent fence or demarcation must be erected around the construction area to prevent access or edge effects to surrounding environs that will not be developed. Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area. Formalise access roads and make use of existing roads and tracks where feasible, rather than creating new routes through naturally vegetated areas that will not be developed. Where the localities of provincially protected and threatened plants cannot be avoided by construction, it must be removed - where possible and feasible - and either used during rehabilitation or be relocated to dedicated open space or conserved areas. These plants can only be removed and relocated with permission (permit) from the Mpumalanga Parks Board (MPB). Re-vegetate developed areas with indigenous plant species as soon as possible. This will prevent erosion and invasion by alien invasive plant species.
Destruction of 'Declining', 'Rare' plant species and 'provincially protected plants'.	<ul style="list-style-type: none"> It is recommended that the rocky ridge area be regarded as sensitive due to the concentration of plants of conservation concern in this area. In addition, the Gauteng Ridge Policy (GDACEL, 2001) should be followed as best practise. This policy discourages development on ridges or rocky outcrops. These areas are characterized by high spatial heterogeneity due to the range of differing aspects (north, south, east, west and variations thereof), slopes and altitudes all resulting in differing soil (e.g. depth, moisture, temperature, drainage, nutrient content), light and hydrological conditions (GDACEL, 2001) and are usually characterized by high biodiversity and therefore their protection contributes to conservation of biodiversity. According to climate change modelling, level topography will be particularly

Impact	Possible mitigation measures
	<p>sensitive to future climate change and major extinction in these areas can be expected (Rutherford <i>et al.</i>, 2001). As such, in a landscape affected by climate change, chances for species survival will be higher on ridges (GDACEL, 2011).</p> <ul style="list-style-type: none"> • Implement a Plant Rescue Plan: Where the plants of conservation concern or provincially protected plants are deemed to be under threat from the construction activity, the plants should be removed by a suitably qualified specialist and replanted into suitable open spaces (this can also be undertaken in collaboration with Operation Wildflower, or the Custodians of Rare and Endangered Wildflowers (CREW). These plants may only be removed with the permission of the provincial authority. • The <i>Crinum</i> species observed was not in flower at the time of the field survey and the species should be confirmed during the summer months. However, it is believed to be <i>Crinum graminicola</i>, which is provincially protected. These plants should be removed prior to commencement construction and where possible, be relocated to suitable habitat outside of the impacted area and monitored for survival. • The provincially protected <i>Gladiolus</i> species and <i>Protea welwitschii</i> also occurs within the development area. Although the <i>Gladiolus</i> species can be transplanted elsewhere, it is unlikely that the <i>Protea</i> species will survive transplanting. • Although the 'Endangered' <i>Frithia humilis</i> was not observed on the site, the possibility of it occurring cannot be ruled out. It is advised that a site visit during its flowering time focus on scanning suitable habitat on the site (flowering period: January). • In order to minimise the potential destruction of protected and threatened plants, it is advised that a summer assessment be undertaken to the sensitive areas in order to identify any species flowering or those that might have been overlooked during the April survey. • Construction workers may not tamper or remove these plants and neither may anyone collect seed from the plants without permission from the local authority.
Destruction and deterioration of the moist grassland.	<ul style="list-style-type: none"> • The minimum buffer zone, as recommended by the wetland specialist, around the moist grassland must be regarded as No-Go areas for the development. Instead, these areas should be incorporated into open space planning • In order to maintain catchment areas to the moist grassland, use permeable paving within the development. • Make use of existing roads and tracks where feasible, rather than creating new routes through moist grassland areas. • Runoff from roads must be managed to avoid erosion and pollution problems. • Remove only the vegetation where essential for construction and do

Impact	Possible mitigation measures
	<p>not allow any disturbance to the adjoining natural vegetation cover.</p> <ul style="list-style-type: none"> • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • Prevent polluted water from reaching the watercourse and surrounding moist grasslands. • An ecologically sound, storm water management plan must be implemented during construction. Ensure that the storm water management of the completed development is adequate to prevent deterioration of the moist grasslands and the Blesbokspruit. • The construction storm water plan could include berms or swales to allow infiltration of rainwater into the soil on the site, thereby retaining the function of the study site as a catchment area for the moist grassland, Blesbokspruit and its tributary. • Do not allow storm water to be canalised. • Prevent contamination of rainwater on the site. • Place and maintain erosion control barriers as appropriate to prevent sedimentation into the watercourse and moist grasslands. • Trucks and equipment should only be washed in dedicated areas and the dirty water is not allowed to discharge into the watercourse or surrounding natural vegetation.
Possible increase in exotic and invasive vegetation.	<ul style="list-style-type: none"> • Alien invasive species, especially category 1b invaders that were identified within the study area, should be removed. By removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation. • All alien seedlings and saplings must be removed as they become evident for the duration of construction. • Manual/mechanical removal is preferred to chemical control. • All construction and operation vehicles and equipment, as well as construction material, should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction areas. This should be verified by the ECO.
Loss of ecological function of the moist grasslands.	<ul style="list-style-type: none"> • Implement an ecologically sound storm water management plan that will allow rainwater within the development to penetrate the soil e.g. via berms or swales as well as permeable paving. • Ensure that the stormwater management system prevents contamination of stormwater and that no polluted water reaches the moist grasslands, Blesbokspruit and the tributary. • Cordon off the main developed area from the surrounding natural vegetation and moist grasslands to prevent any disturbances into the surrounding areas. • Place and maintain erosion control barriers, as appropriate, to prevent sedimentation into the watercourse and moist grasslands. • Incorporate the moist grasslands into open space planning and maintenance.

Impact	Possible mitigation measures
Deterioration and loss of rocky grassland.	<ul style="list-style-type: none"> • Incorporate the rocky grassland into open space planning e.g. an eco-park with formal pathways for pedestrians and cyclist. Ensure that a home owners association takes responsibility for maintaining the natural grasslands and to ensure that no dumping or vehicular access impact on the rocky ridge area occurs. • Regular surveys to ensure the survival of plants of conservation concern within the rocky grassland. • In consultation with a specialist, consider a burning programme to maintain the rocky grassland.
Possible increase in exotic and invasive vegetation.	<ul style="list-style-type: none"> • Alien invasive species that were identified within the study area should be removed prior to construction-related soil disturbances. By removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation. • Landscaping in the development must make use of indigenous vegetation and no alien invasive plant species should be allowed within home gardens.
Heritage Resources	
Disturbance or destruction of cultural and heritage resources.	<ul style="list-style-type: none"> • If the graves (Site 1) are to be impacted, mitigation measures will have to be implemented to protect the graves and negate any possible impacts by the proposed development. This will entail either the formal protection (fencing and management of the site) or exhumation and relocation of the graves to another area. • No mitigation is required for Sites 2-4. • Should any other unknown objects, sites or features of archaeological nature be uncovered during any development activities, the work in that area shall be halted immediately for inspection and recommendations regarding the way forward. This will include any possible and previously unknown, low stone packed or unmarked graves in the area.
Palaeontological Resources	
<ul style="list-style-type: none"> • Construction and development activities: <ul style="list-style-type: none"> ▪ Earth moving equipment/machinery (front end loaders, excavators, graders, dozers); and ▪ Sealing-in or destruction of fossils by development, vehicle traffic and human disturbance. 	<ul style="list-style-type: none"> • Care must be taken during the digging of foundations and removing topsoil, subsoil and overburden. • If any paleontological material is exposed during digging, excavating, drilling or blasting, SAHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures. • These recommendations should form part of the EMP of the project.
Air Quality and Noise	
Generation of dust.	<ul style="list-style-type: none"> • Dust suppression techniques must be applied. • Limit vegetation clearance until it is necessary for soil stripping.
Release of vehicle emissions from construction vehicles.	<ul style="list-style-type: none"> • Regular maintenance of vehicles will minimise the release of emissions.
Generation of nuisance and noise.	<ul style="list-style-type: none"> • Activities that generate the most noise must be scheduled during times

Impact	Possible mitigation measures
	<p>of the day that result in the least disturbance to adjacent receptors.</p> <ul style="list-style-type: none"> Noisy work must be avoided on weekends and public holidays.
Land Capability and Land Use and	
Construction of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.: The current arable, grazing or wilderness land capability will cease completely until the structures is removed. The current land uses such as grazing will cease completely until the structures are removed (which is not foreseen).	All mitigation measures applied on soils will mitigate land capability, as far as possible.
Possible contamination of soil by spillages of fuel or oil by mechanical equipment: Soil physical and chemical properties will be adversely affected and will cause some reduction in land capability.	All mitigation measures applied on soils will mitigate land capability, as far as possible.
Possible soil erosion at exposed building footprints due to higher runoff: Soil erosion will adversely affect land capability.	All mitigation measures applied on soils will mitigate land capability, as far as possible.
Use and maintenance of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.: The pre-construction land capability at areas covered by concrete, tar or paving will remain ceased	All mitigation measures applied on soils will mitigate land capability, as far as possible.
Soil	
<p>The construction of structures that cover the soil surface by means of concrete, tar or paving:</p> <ul style="list-style-type: none"> Compaction of the soil surface for building foundations, parking areas etc. will alter the soil's physical properties negatively; and Covering the soil surface with concrete, tar or paving will cause productive functioning of the soil to cease completely. 	<ul style="list-style-type: none"> Contain construction footprint as far as possible. Prevent removal of the natural vegetation cover where possible.
Possible contamination of soils by spillages of fuel or oil by mechanical equipment. Soil physical and chemical properties will be adversely affected.	<ul style="list-style-type: none"> All accidental fuel and oil spillages will be cleaned up immediately. Contaminated soil will be disposed at a suitable disposal facility. All mechanical equipment will be serviced at an approved facility.
Possible soil erosion at exposed building	<ul style="list-style-type: none"> Implement runoff control measures and structures during the first

Impact	Possible mitigation measures
<p>footprints due to higher runoff:</p> <ul style="list-style-type: none"> Possible soil erosion at exposed construction sites where the current natural vegetation was removed. 	<p>stages of construction as far as possible.</p> <ul style="list-style-type: none"> Contain the construction footprint as far as possible. Prevent removal of the natural vegetation cover, where possible.
<p>Use and maintenance of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.:</p> <ul style="list-style-type: none"> All impacts on soils during the construction phase will remain during the operational phase. The productive functioning of soil at areas covered by concrete, tar or paving will remain ceased 	<ul style="list-style-type: none"> Evaluation of the runoff control system and structures. Rectification where structures are inadequate. Frequent maintenance where necessary and prompt reparation after damages caused by any nature.
<p>Soil pollution from the mixing of concrete.</p>	<ul style="list-style-type: none"> Concrete should ideally be mixed on an impermeable surface such as a concrete slab. Cement bags (new and used) must be stored under roof or in closed containers where they will not be exposed to rain. Dry concrete must be removed and disposed of together with other building rubble. Ready-mix concrete trucks may clean chutes into foundations, but not elsewhere onsite.
Socio-economic	
<p>Generation of a large number of job opportunities.</p>	<p>This is a positive impact and no mitigation measures are therefore required.</p>
<p>Stimulation of the economy and housing sector.</p>	<p>This is a positive impact and no mitigation measures are therefore required.</p>
<p>Potential increase in crime due to the influx of workers, especially during the construction phase.</p>	<ul style="list-style-type: none"> Reference checks should be conducted on all workers before they are appointed. Workers should not be allowed to leave the construction site during the day and should be transported to and from the site on a daily basis.
Traffic	
<p>Increase in traffic volumes to the site during both the construction and operational phases.</p>	<ul style="list-style-type: none"> Drivers must adhere to all speed restrictions and road rules. Routing of vehicles must take other road users into account. Load restrictions must be adhered to.

9.11 Outcome of the site selection matrix

The outcome of the site selection matrix was discussed under Section 8.1.1 of this report.

9.12 Motivation for not considering alternatives (including development footprint alternatives)

The motivation for not considering certain alternatives was discussed under Section 8.1 of this report.

9.13 Concluding statement

The preferred alternative development footprint is the proposed project/development (the Township Development – Pine Ridge Extensions 1 - 25) and the preferred location for the development is the two project properties, as detailed under Section 4 of this report.

9.14 Summary of the findings and recommendations of specialist reports complying with Appendix 6 of the EIA Regulations, 2014, and an indication as to how these findings and recommendations have been included in this Environmental Impact Assessment Report

Herewith a summary of the findings and recommendations of the various specialist reports:

Wetland/Riparian Delineation and Functional Assessment

The following is a summary of the updated Wetland Delineation and Functional Assessment, also compiled by Limosella Consulting (2018):

A follow-up site assessment was undertaken on the 8th of November 2018 to inform an update of the wetland assessment report for this project. Three (3) wetland areas were recorded on the study site (refer to *Figure 17*). The wetland areas were classified as an unchannelled valley bottom wetland, and two seepage wetlands. The unchannelled valley bottom forms part of the Blesbokspruit River and both the seepage wetlands drain directly into the Blesbokspruit River.

The previous study (2014) indicated an additional two seepage areas. Upon further investigation and the additional use of historical aerial imagery, it was found that these areas are unlikely to be functioning wetland areas. The area previously described as a degraded seepage wetland was reclassified as a disturbed area with many quarries, diggings and other disturbances. These disturbances have led to numerous areas of standing water and wetland vegetation and although these areas contribute to habitat for faunal and floral species it is unlikely to contribute to wetland functionality. Furthermore, an additional seepage area was recorded. This area was previously overgrazed with little species remaining. In the 2018 fieldwork, numerous obligate wetland species were recorded here including *Juncus effusus* and *Juncus rigidus*.

The hydrology and geomorphology of the wetland system as a whole has been significantly impacted by the quarrying, diggings and sand mining as well as damming of the unchannelled valley bottom wetland. The vegetation of the wetland system has also been impacted by the quarrying as well as overgrazing. The 2018 study therefore concludes that the seepage area found in 2014 is not currently a functional wetland although it may have been in the past. Implications for development are that the delineated functional wetland as confirmed in 2018 (the channelled valley bottom wetland, seepage 1 and 2), together with their recommended buffer zones should be excluded from the development footprint. The seepage area identified in 2014 and omitted from the 2018 delineation may be included in the development layout given that strict mitigation measures ensure that no negative impact results to the downstream wetlands.

A summary of the functional assessment scores obtained for the wetland and watercourses are presented in the tables below. A summary of the important findings discussed in this assessment are also provided (Limosella, 2018).

Classification (SANBI, 2013)	PES (Macfarlane <i>et al</i> , 2007) and VEGRAI (Kleynhans <i>et al</i> , 2008)	EIS (DWAF, 1999) and QHI (Seaman <i>et al</i> , 2010)	WetEcoServices (3 most prominent scores)	Scientific Buffer (Macfarlane <i>et al</i> 2015)		REC
				Construction	Operational	
Unchannelled Valley Bottom	3.5 C	3.7 (Very	Sediment Trapping – 3.0	37 m	17 m	C

Classification (SANBI, 2013)	PES (Macfarlane <i>et al</i> , 2007) and VEGRAI (Kleynhans <i>et al</i> , 2008)	EIS (DWA, 1999) and QHI (Seaman <i>et al</i> , 2010)	WetEcoServices (3 most prominent scores)	Scientific Buffer (Macfarlane <i>et al</i> 2015)		REC
				Construction	Operational	
Wetlands		High)	Stream Flow Regulation – 2.7 Natural Resources – 2.3			
Seepage Wetland 1	3.4 C			51 m	22 m	C
Seepage Wetland 2	3.6 C			51 m	22 m	C

	Quaternary Catchment and WMA areas	Important Rivers possibly affected
	B11K– 2 nd WMA - Olifants	Drains directly into the Blesbokspuit on the study site
Does the specialist support the development?	Yes. However, it should be done in a manner that does not further alter the natural watercourses, or the biodiversity status of the surrounding habitat.	
Recommendations	<ul style="list-style-type: none"> The development should take into account the qualified presence of sensitive and protected flora, fauna and avifauna species. Design of structures should aim to have the least impact on habitat quality and hydrology of the watercourses and should include attenuation structures to contribute to regional flood control and rehabilitation. Maintain sewage infrastructure to ensure that leaks do not enter the watercourses. Implement the principles of Sustainable Urban Drainage. Control of alien invasive plants should form part of the maintenance plan. Ensure that overgrazing in the wetland does not occur. Install and maintain litter traps. 	

Aquatic Assessment

The aquatic environment (the Blesbokspuit) was assessed to determine the water quality as well as the Present Ecological Status (PES). The Overall Ecological Category of the Blesbokspuit was determined to be between C and D. This indicates that the aquatic environment can be considered “fair” to “poor” and is moderately to largely modified.

The water quality analysis indicated that, for all measured parameters, measures fell outside of the Department of Water Affairs’ recommendations for domestic, irrigation, and livestock watering uses.

The Blesbokspuit is significantly impacted upon and further deterioration should be avoided in order to conserve this natural resource (Iggdrasil Scientific Services, 2014).

Fauna Assessment

The site is presently used for cattle grazing, however, in the past some earthworks towards the north-east of the site damaged the natural character of the site. There are no forms of development on the site, in the form of buildings. The earthworks to the east, though, have entirely transformed the terrestrial habitat.

The soil is generally light and sandy, at places with protruding rock and gravel. The slopes are rocky with light-brown soil. Termitaria were recorded. Barring low indigenous shrubs along the slopes and exotics such as scattered blue gums, the site is entirely devoid of trees. There are no caves for the occurrence of cave-dwelling bats.

To the west and south, the site is bordered by established suburbia and to the east by the extensive and intensively excavated earthworks. However, to the north the site borders on undeveloped grazing land. Terrestrial vertebrate connectivity can therefore be expected to be operational along the streams as well as to the north.

Mammals

The terrestrial habitat is the most extensive habitat found on the project site. However, it has been ecologically over-used by past tillage practices, grazing activity as well as possible irregular fires. As such, it can only be rated as a “Very Low” to “Low” conservation condition. Secondary grasslands can be lush and is therefore good cover for terrestrial mammals.

The rupicolous habitat found along the rocky slopes is poorly developed and contains a lack of refuges in the form of nooks and crannies amongst the large rocks. However, less discerning species, such as the Namaqua rock rat and rock elephant shrew, are more likely to find refuge here. As such, they are deemed to be present, with red rock rabbits being recorded. Basal cover of the slopes has less evidence of degradation by grazing than the lowlands. Therefore, the area is in an ecological state of repair, justifying a conservation rating of “Average”.

The wetland habitat along the Blesbokspuit, its tributary and the dams are the main features of the site. Semi-aquatic vegetation found along the banks is excellent habitat for species such as shrews, vlei rats and marsh mongooses. Reed beds and stands of bulrushes, as well as other semi-aquatic vegetation, is not utilised by cattle and the conservation status of this habitat can be rated as “Good”.

The species diversity (that being species richness superimposed on population numbers) and richness is low for such an extensive area. This is likely due to the fact that two of the three habitats have been transformed by past land-use changes (terrestrial) or weakly developed (rupicolous). The quality of conservation is largely ranked as poor and this has resulted in the displacement of Red Data species.

The presence of the following species onsite was confirmed during the site visit:

- Aardvark – *O. afer* – confirmed based on damage to termitaria
- Red rock rabbit – *P. randensis* – confirmed based on faecal pellets
- Highveld gerbit – *G. brantsii* – confirmed based on the presence of burrows

Red Listed Mammals

The four shrew species and the African weasel cited as “Data Deficient” are not necessarily endangered. These small mammals have not been adequately studied to provide quantitative field data to accurately assign a conservation ranking. As a precaution they are therefore considered as ‘Data Deficient’. Shrews and weasels exist at the apex of the food pyramid, which means that their population numbers are inevitably significantly lower than that of similar-sized herbivorous mammals and especially of their smaller prey species. As a result of the diet of these voracious little insectivores/carnivores, they are furthermore not readily trapped with conventional bait or traps which may mean that their numbers are under-estimated. Good results obtained with drift fences and pitfalls support the latter statement.

Hedgehogs are ‘Near Threatened’ as a result of interference by humans and their pets. Under natural conditions, the passive defence mechanisms of these rather docile insectivores are sufficient to maintain breeding populations in a healthy condition. Considering the size of the district and connectivity towards the north it is considered possible that a small population of hedgehogs persist.

No other Red Data or sensitive species are deemed present on the site, either since the site is too disturbed, as it falls outside the distributional ranges of some species, or it does not offer suitable habitat/s.

Birds

Three main avian bird habitats are distinguished on site; various forms of grassland-, wetland- and rocky habitat are present, and are discussed below.

A total of 198 - 260 bird species have been recorded in the Witbank area. Out of these, only 180 are expected to occur in and around the site. Eighty (80) have a high probability of occurrence, 56 have a medium probability of occurrence and 43 have a low probability of occurrence. This indicates the limited potential of the best habitats, but the relatively poor condition of the remainder.

Based on the total of 273 assessments of predicted habitat preference, the wetland habitats are potentially the richest and most distinctive habitat, predicted to be used by 133 (49%) of the expected species, compared to 80 (29%) for the open grasslands and 60 (22%) for the rocky grasslands.

Red Data Listed Birds

Thirteen (13) species of international and/or national conservation concern may occur on site, ranging from *Least Concern* to *Endangered*, although none were recorded during the survey. Most threatened species are expected to make use of the grasslands, a few including use of the wetlands, but only three are largely dependent on the wetlands. Only two species are expected to be frequent visitors, the *Least Threatened* Melodious Lark when the grasslands form suitably patchy habitat for it to occupy the area and perhaps even breed, and the *Vulnerable* Southern Bald Ibis, but only for foraging when short and/or burnt grasslands are formed for nomads from breeding colonies as close to the east as the Middleburg area. The remaining species are expected as erratic visitors or infrequent vagrants, due to a combination of the inferior habitats available and/or a low visitation rate to the region.

Only two species might be expected to sometimes stay over in the area for longer periods (the Melodious Lark and the *Vulnerable* White-bellied Korhaan), roosting and maybe even breeding should conditions be conducive – although it should be noted that the latter species is only expected as an erratic visitor at best based on the quality of habitats available.

Herpetofauna

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is therefore possible to deduce the presence or absence of reptile and amphibian species by evaluating the habitat types within the context of global distribution ranges.

Of the 45 reptile species that may occur on the study site, three were confirmed during the site visit and of the possible 19 amphibian species that may occur on the study site, three were confirmed during the site visit.

The presence of the following species onsite was confirmed during the site visit:

- Spotted Sand Lizard – *Pedioplane lineocellata* – sight record
- Eastern Striped Skink – *Trachylepis striata* – sight record
- Transvaal Gecko - *Pachydactylus affinis* – sight record
- Common Platanna - *Xenopus laevis* – sight record of juvenile
- Common River Frog - *Amietia angolensis* – sight record
- Striped Stream Frog - *Strongylopus fasciatus* – vocalisation

Sixty-four (64) herpetofauna species are recorded as potential occupants of the study site. Most of these herpetofauna species are robust generalists with the ability to capitalise on disturbed environments. It should be noted that potential occurrence is interpreted as being possible over a period of time, as a result of expansions and contractions of population densities and ranges that stimulate migration.

Red Data Listed Herpetofauna

The striped harlequin snake has not been recorded in the quarter degree square of the site (TVL Museum Records). The study site contains moribund termitaria, where this species is most likely to be found. It is very difficult to confirm whether this cryptic snake is present on any study site, but a small possibility exists that the striped harlequin snake occurs on this particular study site. The spotted harlequin snake is usually found in deserted termite mounds or under rocks (Alexander & Marias, 2007). These types of micro habitats are not abundant on the study site, but do occur in some places.

The many-spotted snake is a secretive snake. Potential habitat for this snake species is wetland-associated vegetation cover at the water edge. If the water bodies with their buffer habitat are protected, this species should also be protected.

Although distribution records for the giant bullfrog in Mpumalanga are patchy, potential breeding sites for them are present on the study site. These breeding sites are temporary, which bullfrogs prefer in order to avoid predation from fish. They also need water bodies of which at least one side has a very gentle slope. A gentle slope allows for shallow water (less than 9cm deep), which enables the female bullfrog to stand when she lays her eggs outside the water for the male to fertilise. Many parts of the study site consist of sandy soil and are very suitable as a dispersal area, which combines feeding and aestivation. It is essential that the soil be suitable for burrowing on a daily basis during the short activity period at the beginning of the rainy season and for deeper retreats during the resting periods. Importantly, the giant bullfrog's status has changed from Near Threatened to Least Concern in South Africa (Rautenbach *et al.*, 2014).

Vegetation/Flora Assessment

Historical aerial images (Google Earth) indicated that much of the northern and eastern portions as well as a small portion of the north westerly corner of the site were historically cultivated. Disturbances along the tributary of the Blesbokspruit were noted due to the large quarry situated on the northern section of the site. Large herds of cattle presently graze the site and numerous kraals, past and present, were noted on the site. These kraal areas were transformed and a number of weedy plant species were found.

The proposed development site is situated within the Grassland Biome of South Africa and is dominated by grasslands wherein high summer rainfall, combined with dry winters, frost and veld fires lead to unfavourable conditions for the growth of indigenous trees. Thus, the grassland biome consists mainly of grasses and plants with perennial underground storage organs. The majority of *Rare* and *Threatened* plant species in the summer rainfall regions of South Africa are restricted to high-rainfall grasslands, making the Grassland Biome in most urgent need of conservation.

As per the National Vegetation Map, the vegetation type that is expected to occur on the study site is classified as Rand Highveld Grassland (Mucina & Rutherford, 2006). The Rand Highveld Grassland is classified as an 'Endangered' vegetation unit, but is listed as a 'Vulnerable' ecosystems based on irreversible loss of natural habitat.

Mpumalanga Biodiversity Conservation Plan (MBCP)

According to the MBCP, the site comprised mainly of areas classified as having "No Natural Habitat Remaining" and "Least Concern" to reach conservation targets. However, a portion classified as "Important and Necessary" to reach the conservation targets of the Province is situated on the northern boundary of the site. Areas that are classified as "Important & Necessary" are significantly important areas of natural vegetation that play an important role in meeting

biodiversity targets. As per the MBCP, these areas should only be used to benefit the biodiversity assets and reduce the vulnerability. Therefore, land uses that transform the natural state are not supported in “Important and Necessary” areas.

The following vegetation groupings are present on the study site:

Transformed vegetation

- Alien invasive tree clumps; and
- Areas transformed by mining and intense trampling and grazing by cattle.

Grassland

- Secondary and Degraded grassland;
- Rocky grassland; and
- Moist grassland.

Transformed vegetation

- Alien invasive tree plantations: The transformed land on site was characterised by vegetation that no longer comprised of the expected natural grassland species diversity. Instead, the transformed land was dominated by alien invasive tree species. Clumps of *Acacia mearnsii* and *A. dealbata* (Wattle species) and *Eucalyptus camaludensis* (Red River Gum) were likely planted and from there spread into disturbed soils and along moisture gradients on the site. The *Eucalyptus* species is a declared category 1b invasive plant and must be removed. Due to the degraded nature of the transformed land, no plant species of conservation concern were observed in this area and neither are these species expected to persist within the transformed land.
- Areas disturbed by mining and cattle kraals: A large quarry area is situated on the north-eastern portion of the site. There is evidence that much of the north-eastern section of the site has been quarried historically. This area is highly degraded from the natural grassland state. Rehabilitated areas surrounding the quarry include a number of indigenous pioneer grass species such as *Hyparrhenia hirta* (Common Thatching Grass), *Cynodon dactylon* (Couch Grass) and *Eragrostis gummiiflua* (Gum Grass). The herbaceous layer comprised of weedy species such as *Richardia brassiliensis* and *Solanum sisymbirifolium*.

The site has also been grazed by large herds of cattle. The kraal area, situated on the northern portion of the site in close proximity of the confluence of the Blesbokspruit and the tributary, shows evidence of being moved a number of times. As a consequence, there are a number of overgrazed and trampled patches that have subsequently been colonised by weedy and pioneer species, as well as the exotic grass *Pennisetum clandestinum* (Kikuyu Grass). No plants of conservation concern were observed in the transformed areas. The high degree of transformation and invasive species lowers the ecological function, as well as conservation value of these areas.

Grassland

Grassland vegetation present on the site was characterised by the dominance of grass and herbaceous species, with a limited number of tree and shrub species present. The various patches of grassland were observed to vary in species composition depending on past and current land use, as well as its position in the landscape. Lower lying areas were observed to contain plant species adapted to temporary or permanently wet soils, while other grassland areas contain rocky substrate and a higher plant species composition. Yet other portions were degraded due to grazing or in a secondary state due to historic cultivation.

- Secondary and degraded grassland: Secondary grassland was observed where past cultivation removed the vegetation layer and disturbed the soils. Prolonged cultivation reduced the seed bank in the soils as well as the

likelihood of geophytes (e.g. bulbs) surviving. Although the fallow lands were colonised by indigenous grass and some herbaceous species, the species diversity remained low compared to what could be expected in intact, primary (undisturbed) Rand Highveld Grassland (Mucina & Rutherford, 2006).

A number of weedy species (*Richardia brasiliensis*, *Solanum elaeagnifolium* (Silverleaf Bitter Apple) and *Solanum sisymbriifolium*) were found at the site, growing abundantly where grazing and trampling took place. One geophyte, a *Gladiolus* specie, was observed in the secondary grassland as well as in the rocky grassland. The plant was dormant and the dried plant parts hampered identification to species level. It is likely that more individuals occur sporadically in the secondary grassland.

Although grassland re-established within the fallow lands, succession has not yet progressed to the point where the original species diversity was reached. It is thought that the constant grazing pressure within the secondary grasslands on site will likely keep these grasslands in a subclimax state/secondary state.

Degraded grasslands comprised grassland that was degraded by continuous grazing pressure as well as the invasion of alien invasive plant species such as *Pennisetum clandestinum* (Kikuyu Grass) and various *Solanum* species. The grassland was further characterised by a diversity of Increaser II and III grasses (grass species that increase in over utilised/overgrazed veld) and a high frequency of the shrub *Seripheum plumosum* (Bankrupt Bush), which is known to increase in overgrazed grassland.

Continuous grazing pressure reduced palatable grasses and subsequently changed the species composition from what is expected in natural Rand Highveld Grassland (Mucina & Rutherford, 2006).

- Rocky grassland and near-natural grassland: Areas that were not historically ploughed or severely trampled and grazed were included in the rocky grassland vegetation grouping. The rocky grasslands were observed on top of the ridge growing on and between rocky sheets, boulders and within shallow soils. Rocky grasslands were also noted on the slopes and lower lying areas where rocky sheets occurred sporadically. A higher diversity of species that naturally occur within the Rand Highveld Grassland was found, although a number of Increaser II & III grasses dominated due to the high grazing pressure.

The ridge area contained a number of plants of conservation concern. One individual of the Declining bulb *Boophone distichia* (Poison Bulb) and the Rare *Pavetta zeyheri* subsp. *middelburgensis* were observed, while the provincially protected *Protea welwitschii* (White Sugarbush) grew abundantly on the ridge. An unidentified *Crinum* species (thought to be *Crinum graminicola*) was also observed to occur sporadically in the rocky grasslands, but in deeper soils. Only one (1) invasive species (*Richardia brasiliensis*) was noted in the area.

The rocky grasslands were representative of the Rand Highveld Grassland. It is therefore of a higher conservation concern than the secondary grasslands.

- Moist grassland: Moist areas and seepage were observed along the Blesbokspruit and the tributary on the northern boundary of the site. These seep areas extended into the rocky grasslands and included species that are adapted to grow in temporary saturated condition, likely due to an impervious soil layer. Even areas where sand was likely mined in the past, showed clear signs of surface and subsurface water movement towards the tributary. Much of the seep areas in the northern portion of the site were overgrazed due to the availability of moisture for longer periods during the year.

The moist grasslands are well vegetated and play a role in the functionality of the wetlands on site, and the associated hydrology thereof. This is in spite of the fact that sand mining historically impacted on the tributary and grazing and invasive tree species currently impact upon the moist grassland.

The flora assessment recorded 15 grass species, 17 herbaceous species, 8 sedges, and 4 alien or invasive plant species within the moist grasslands. Moist grasslands are expected to have a lower diversity than terrestrial grasslands as fewer plants are adapted to grow in saturated conditions. It is likely that some plant species of conservation concern such as *Crinum bulbispermum*, *Eucomis autumnalis* and a number of orchid species could occur in the moist grasslands. However, these were not observed, likely due the disturbed nature of some of the moist grassland, as well as grazing pressure and seasonality. A wetland buffer zone should be adequate to protect these plants if they do indeed occur.

Nationally Protected Plants

A list of twelve (12) plants of conservation concern was compiled. Of these, one species is *Endangered*, two are *Vulnerable*, three are *Near Threatened*, four are *Declining*, one is naturally *Rare* and one is classified as *Data Deficient*.

During the field survey, species for which suitable habitat exists on site were surveyed for. Of these short-listed species, suitable habitat existed for about four species, while two were confirmed to occur. The Declining species *Boophone distichia* (Poison Bulb) and the Rare species (*Pavetta zeyheri* subsp. *middelburgensis*) were confirmed to occur within the rocky grassland on the ridge. A *Crinum* species, thought to be *Crinum graminicola* was also recorded on site. Although this plant is not threatened, the closely related *Crinum macowanii* is a Declining species that may occur on the site. The flowering period (October-December) should be used to confirm this.

The Endangered *Frithia humilis* is a small succulent, which is known to occur within the area that the site is situated in. However, this plant was not observed during the investigation and the absence of gravelly quartz on the rocky sheets surveyed makes it unlikely that the plant occurs on site.

Although only one individual of *Boophone distichia* (Poison Bulb) was identified, it is likely that more plants could be present. Poison Bulb is extensively harvested for the medicinal plant trade and therefore the numbers in the wild is declining. If the *Boophone distichia* and the *Pavetta zeyheri* subsp. *middelburgensis* are deemed to be under threat of the proposed development, the plants should be removed and relocated to nearby, suitable habitat. Note that these plants can only be removed with permission of the Mpumalanga Tourism and Parks Agency (MTPA).

Provincially Protected Plants

A number of plants are provincially protected by the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998). These species may not be removed, pruned or damaged without a permit from the Mpumalanga Tourism and Parks Agency (MTPA).

Four provincially protected species were confirmed to occur on the site:

- *Crinum* species – all species are protected, however, the species is likely to be *C. graminicola* (sighted at 25°48'16.77"S; 29°11'36.90"E and 25°48'31.81"S; 29°11'53.32"E).
- *Protea welwitchii* – all species are protected, and it was confirmed to occur in rocky grassland on the hill directly east of the Blesbokspuit.
- *Gladiolus* species – all species are protected and sporadic occurrence of at least two species in rocky and secondary grassland were observed (sighted at 25°48'37.01"S; 29°11'47.04"E, 25°48'32.82"S; 29°11'7.21"E and 25°48'58.95"S; 29°12'59.48"E).
- *Pellaea calomelanos* – species is protected and was confirmed to occur in rocky grassland, wedged between rocks (sighted at 25°48'17.46"S; 29°11'35.35"E and 25°47'53.28"S; 29°11'53.85"E).

Two provincially protected species were likely to occur, but were not confirmed to occur on site:

- *Eucomis* species (Pineapple plant) – all species are protected and are likely to occur in moist- and rocky grassland;
- *Habenaria* species, *Eulophia ovalis* subsp. *ovalis*, *E. welwitschii* – All belong to Orchidaceae, are protected and possibly occur in moist grasslands (often overlooked when not in flower from February to April).

Medicinal Plant Species

A minimum of 16 plants known to be used medicinally were recorded on the study site.

Alien Invasive Plant Species

The following category 1b species exist on the site and must be removed by implementing an Alien Invasive Plant Management Programme in compliance of Section 75 of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004):

1. *Cirsium vulgare* (Scotch Thistle)
2. *Eucalyptus camaldulensis* (Red River Gum)
3. *Solanum sisymbirifolium* (Wild Tomato) (Dimela Eco Consulting, 2014).

Phase 1 Heritage Impact Assessment

Four sites of recent historical age were identified during the assessment in the study area, of which one was a grave site, and the other three were related to farming. These are discussed below:

Site 1

A grave site, containing at least ten (10) graves was found on site. Some of the graves are stone packed, while most have formal cement headstones and grave dressing. The age of the gravestones, or the identities of the deceased, could not be determined as the inscriptions on the headstones are illegible.

GPS Location: 25°48'46.8"S; 29°13'11.9"E

Cultural Significance: High (graves always carry a High Significance Rating)

Heritage Significance: Grade III: Other heritage resources of local importance and therefore worthy of conservation

Field Ratings: Local Grade IIIB: Should be included in the heritage register and may be mitigated (high/medium significance).

Sites 2-4

All three sites relate to recent farming activity in the area. This includes foundations of a recent homestead on Site 2, probably belonging to farm labourers, stone packed remains of livestock enclosures on Site 3 and 4, as well as possible labourer homestead remains on Site 3. It is not clear whether Sites 3 and 4 fall within the direct development area. No further mitigation is necessary as these sites are only represented by foundations and by ephemeral and low stone walling, and are therefore not considered significant.

GPS Locations: Site 2 - 25°48'31.2"S; 29°12'30.4"E; Site 3 - 25°48'12.1"S; 29°11'51.7"E; and Site 4 - 25°48'14.6"S; 29°11'50.1"E

Cultural Significance: Low to Medium

Low: A cultural object being found out of context, not being part of a site or without any related feature/structure in its surroundings.

Medium: Any site, structure or feature being regarded less important due to a number of factors, such as date and frequency. Also any important object found out of context.

Heritage Significance: None

Field Ratings: General protection C (IV C): Phase 1 is seen as a sufficient recording of the existing structure and it may therefore be demolished (low significance)

Desktop Palaeontological Impact Assessment

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity can generally be **low** to **very high**, and here locally (on the site) **low** for the Dwyka Group and **low** for the Waterberg Group.

Recommendation

- a. There is no objection (see Recommendation B below) to the development and it may not be necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity is **LOW**. A Phase 2 Palaeontological Mitigation may be required if a Phase 1 Palaeontological Assessment identified a fossiliferous formation (e.g. Vryheid Formation). Protocol is attached (Appendix 2).
- b. This project will benefit the economy, the growth of the community and social development in general.
- c. Preferred choice: The impact on the palaeontological heritage is **LOW**. The presence of shale may be problematic. Care must be taken during the digging of foundations and removing topsoil, subsoil and overburden.
- d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.

Soil, Land Capability and Land Use Assessment

A total of 19 homogeneous soil units, based on dominant soil form, effective soil depth, internal drainage, terrain unit and slope percentage were identified during field observations and were symbolised as: Hu1, Hu2, Hu3, Gc1, Cv1, Cv2, Cv3, Cv4, Cv5, Gc2, Ms/R, Wa, Cf, Fw, Fw-D, Kd and Wb1. Two non-soil related units were identified and symbolised as Exc1 and Exc2 which consist of excavated and partly excavated areas. A map of the different soil types can be seen in *Figure 6*. The land capability map can be seen in *Figure 7*.

Approximately 24.53% (124.4 ha) of the Soil Study Area is dominated by soils with **arable land capability**, consisting of red and brownish yellow, apedal, loamy sand to sandy loam soils. These arable soils are dominated by Hutton, Glencoe and Clovelly soil forms.

Approximately 50.89% (258.06 ha) of the Soil Study Area is dominated by soils with **grazing land capability** consisting of shallow brownish yellow, apedal, loamy sand soils and shallow rocky/stony soils. These soils are dominated by Clovelly, Glencoe and Mispah soil forms.

Approximately 13.52% (68.56 ha) of the Soil Study Area was classed as **wetland**, consisting of grey, imperfectly to poorly drained sandy soils. These soils are dominated by Wasbank, Cartref, Fernwood and Kroonstad soil forms, symbolized as soil types Wa, Cf, Fw, Fw-D and Kd.

Approximately 11.08% (56.17 ha) of the Soil Study Area consists of areas classed as **wilderness land**. Unit Wb1 consists of a previously excavated site that appears to be rehabilitated to some extent. Unit Exc1 consists of a site where soil are currently excavated, but are also backfilled simultaneously in some sections. Unit Exc2 consists of excavated sites where sand is currently mined as well as a former road quarry.

Pre-mining land use (proposed Development area)

The majority (80.19%) of the proposed Development Area is utilized for grazing purposes from time to time. A further 12.22% of an area that was previously mined/excavated is grazed simultaneously although the carrying capacity is probably very low. This translates to 92.4% of the Development Area that is currently utilized for grazing purposes. The other disturbed areas that have no grazing capacity consists of the current sand mining pit (1.37%), a former sand mining pit (0.01%) and the current quarry and landfill area (4.58%), which translates to a total of 5.96%. The remainder (1.64%) of the proposed Development Area is occupied by very small uses such as a dam, gravel road, tar road, cemetery and soccer field.

Geotechnical Investigation

The northern portion of the site is underlain by shale and tillite of the Dwyka Formation, Karoo Supergroup, as well as sandstone, quartzitic sandstone and conglomerate of the Wilge River Formation, Waterberg Group, towards the Blesbokspruit River. The bedrock is covered by transported material, termed "hillwash", in the test pit profiles. No dolomite occurs in the area and as such no dolomite stability investigation was required (GEOSSET CC, 2014).

Traffic Impact Study

It was estimated that Pine Ridge Extension 1 - 4 will generate approximately 850 vph during weekday AM peak hour and 1 263 vph during weekday PM peak hour. Pine Ridge Extension 5 - 25 is estimated to produce a maximum of 2 122 vph during both weekday AM and PM peak hours.

The Saaihoek road (D1126) is expected to experience a significant impact due to the additional development traffic. As such, the upgrading at all four (4) key intersections from a capacity viewpoint will be required (according to the SIDRA analysis). Access onto D1126 will also require upgrading.

The proposed access into the township development is located approximately 750m to the north of the access to Pine Ridge Extension 1-4. This will require a short deceleration from the south on the D1126 as well as a short separate right-turn lane from the north. Access into the development is approximated 510m north of the Flamingo Street intersection. Road widening will be required on the Saaihoek Road (D1126).

A minimum of ten (10) Minibus-taxi Lay-by's are proposed on the main road within the proposed development. The exact positions of these should be decided by the Emalahleni Local Municipality in conjunction with the local Taxi Associations.

The proposed development is feasible in terms of traffic generation and impact, and so it is supported from a traffic engineering perspective. This is in light of the proposed Lay-by's and Site Access road with the relevant road widening of road D1126 being properly designed and constructed to appropriate design standards of the relevant Road Authority.

The findings and recommendations of the specialist reports have been incorporated in this Environmental Impact Assessment Report under Sections 8.3 and 9.10. The findings and recommendations have also been incorporated into Section 8.1 of the draft Environmental Management Programme that forms part of this report.

10. ENVIRONMENTAL IMPACT STATEMENT

10.1 Summary of the key findings of the Environmental Impact Assessment

The summary of the key findings of this Environmental Impact Assessment process are as follows:

- Three (3) wetland areas were recorded on the study site (refer to *Figure 17*). The wetland areas were classified as an unchannelled valley bottom wetland and two seepage wetlands. The unchannelled valley bottom forms part of

the Blesbokspruit River and both the seepage wetlands drain directly into the Blesbokspruit River. The hydrology and geomorphology of the wetland system as a whole has been significantly impacted by the quarrying, diggings and sand mining as well as damming of the unchannelled valley bottom wetland. The vegetation of the wetland system has also been impacted by the quarrying as well as overgrazing. The 2018 study therefore concludes that the seepage area found in 2014 is not currently a functional wetland although it may have been in the past. Implications for development are that the delineated functional wetland as confirmed in 2018 (the channelled valley bottom wetland, seepage 1 and seepage 2), together with their recommended buffer zones should be excluded from the development footprint. The seepage area identified in 2014 and omitted from the 2018 delineation may be included in the development layout given that strict mitigation measures ensure that no negative impact results to the downstream wetlands. The proposed development is supported by the wetland specialist, however, the development should be conducted in a manner that does not further alter the natural watercourses or the biodiversity status of the surrounding habitat.

- The aquatic Overall Ecological Category of the Blesbokspruit was determined to be between C and D. This indicates that the aquatic environment can be considered “fair” to “poor” and is moderately to largely modified. The water quality analysis indicated that, for all measured parameters, measures fell outside of the Department of Water Affairs’ recommendations for domestic, irrigation and livestock watering uses. The Blesbokspruit is significantly impacted upon and further deterioration should be avoided in order to conserve this natural resource.
- The vegetation type of the proposed development site is classified as Rand Highveld Grassland (Mucina & Rutherford, 2006). The Rand Highveld Grassland is classified as an ‘Endangered’ vegetation unit, but is listed as a ‘Vulnerable’ ecosystems based on irreversible loss of natural habitat. Historical aerial images (Google Earth) indicated that much of the northern and eastern portions as well as a small portion of the north westerly corner of the site were historically cultivated. Disturbances along the tributary of the Blesbokspruit were noted due to the large quarry situated on the northern section of the site. Large herds of cattle presently graze the site and numerous kraals, past and present, were noted on the site. These kraal areas were transformed and a number of weedy plant species were found.
- According to the Mpumalanga Biodiversity Conservation Plan, the site comprised mainly of areas classified as having “No Natural Habitat Remaining” and “Least Concern” to reach conservation targets. However, a portion classified as “Important and Necessary” to reach the conservation targets of the province is situated on the northern boundary of the site. Areas that are classified as “Important & Necessary” are significantly important areas of natural vegetation that play an important role in meeting biodiversity targets.
- The following vegetation groupings are present on the study site: Transformed vegetation (alien invasive tree clumps and areas transformed by mining and intense trampling and grazing by cattle) and Grassland (Secondary and Degraded grassland; Rocky grassland; and Moist grassland).
- Nationally Protected Plants: The Declining species *Boophone distichia* (Poison Bulb) and the Rare species (*Pavetta zeyheri* subsp. *middelburgensis*) were confirmed to occur within the rocky grassland on the ridge. A *Crinum* species, thought to be *Crinum graminicola* was also recorded on site. Although this plant is not threatened, the closely related *Crinum macowanii* is a *Declining* species that may occur on the site. Although only one individual of *Boophone distichia* (Poison Bulb) was identified, it is likely that more plants could be present. Poison Bulb is extensively harvested for the medicinal plant trade and therefore the numbers in the wild are declining. If the *Boophone distichia* and the *Pavetta zeyheri* subsp. *middelburgensis* are deemed to be under threat of the proposed development, the plants should be removed and relocated to nearby, suitable habitat.
- Provincially Protected Plants: Four provincially protected species were confirmed to occur on the site (a *Crinum* species; *Protea welwitschii*; *Gladiolus* species; and *Pellaea calomelanos*). Two provincially protected species were likely to occur, but were not confirmed to occur on site: *Eucomis* species (Pineapple plant) and *Habenaria* species, *Eulophia ovalis* subsp. *ovalis*, *E. welwitschii*.
- The following category 1b species exist on the site and must be removed by implementing an Alien Invasive Plant Management Programme in compliance of Section 75 of the National Environmental Management: Biodiversity Act

(Act No. 10 of 2004): *Cirsium vulgare* (Scotch Thistle); *Eucalyptus camaldulensis* (Red River Gum); and *Solanum sisymbirifolium* (Wild Tomato).

- In terms of Archaeological and Heritage Sites, a grave site, containing at least ten (10) graves, was found on site. Some of the graves are stone packed, while most have formal cement headstones and grave dressing. The age of the gravestones, or the identities of the deceased, could not be determined as the inscriptions on the headstones are illegible. The cultural significance of the grave site is *High*. The grave site should be included in the heritage register and may be mitigated (high/medium significance). SAHRA has indicated that the grave site should be protected and fenced. No further mitigation is necessary for the recent homestead on Site 2, the stone packed remains of livestock enclosures on Site 3 and 4, as well as possible labourer homestead remains on Site 3 as these sites are only represented by foundations and by ephemeral and low stone walling, and are therefore not considered significant.
- There is no objection to the proposed development from a Palaeontological perspective and it may not be necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity is **LOW**. The presence of shale may be problematic. Care must be taken during the digging of foundations and removing topsoil, subsoil and overburden. If any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.
- Although terrestrial animals will mostly be displaced, it is argued that the loss of Red Data and sensitive species has largely been discounted by earlier environmental degradation. However, the streams, dams and riparian zones, with their relatively undisturbed moist and semi-aquatic vegetation, are recognised as sensitive and should be awarded appropriate conservation attention. Given the rigid protection of the wetland system and prerequisite buffer zones, no justifiable objection can be raised against the development of the project on the terrestrial portion of the site. From a vertebrate perspective, development along the weakly developed ridges will not amount to an environmental setback.
- The proposed development is feasible in terms of traffic generation and impact and is therefore supported from a traffic engineering perspective. This is in light of the proposed Lay-by's and Site Access road with the relevant road widening of road D1126 being properly designed and constructed to appropriate design standards of the relevant Road Authority.
- The proposed development will result in a positive socio-economic impact through the provision of a number of temporary and permanent job opportunities as well as the stimulation of the economy and housing sector.
- The environmental impacts associated with the proposed development have been identified and assessed in terms of their significance in this report. The most significant impacts relate to the following:
 - Changing the quantity and fluctuation properties of the watercourse.
 - Increased surface water runoff due to hardened surfaces.
 - Increased erosion and sedimentation.
 - Pollution of watercourses, wetlands, surface- and/or groundwater resources due to the release of pollutants and sewage.
 - Loss of ecological sensitive and important vegetation units (wetlands).
 - Loss of ecosystem function (e.g. reduction in water quality, soil pollution).
 - Destruction of natural rocky vegetation, in particular the rocky ridge, and deterioration of rocky grassland.
 - Destruction of plant species that are 'Declining', 'Rare' or 'Provincially protected'.
 - Destruction of moist grassland and the deterioration of the vegetation associated with moist grasslands.
 - Loss of the ecological function of the moist grasslands.
 - Disturbance or destruction of cultural and heritage resources – Site 1 (Graves).
 - Release of vehicle emissions from construction vehicles.

- The current arable, grazing or wilderness land capability and land use will cease completely until the structures are removed (which is not foreseen).
- The pre-construction land capability and land use at areas covered by concrete, tar or paving will remain ceased. The productive functioning of soil at areas covered by concrete, tar or paving will remain ceased.
- Compaction of the soil surface for building foundations, parking areas etc. and covering the soil surface with concrete, tar or paving will alter the soil's physical properties negatively and cause productive functioning of the soil to cease completely.
- Soil pollution from the mixing of concrete.
- Pollution of surface and/or groundwater resources due to the runoff of contaminated stormwater.
- The majority of the impacts are rated as having a “Medium” significance before mitigation and a “Low” significance after mitigation.

10.2 Environmental sensitivity overlay maps

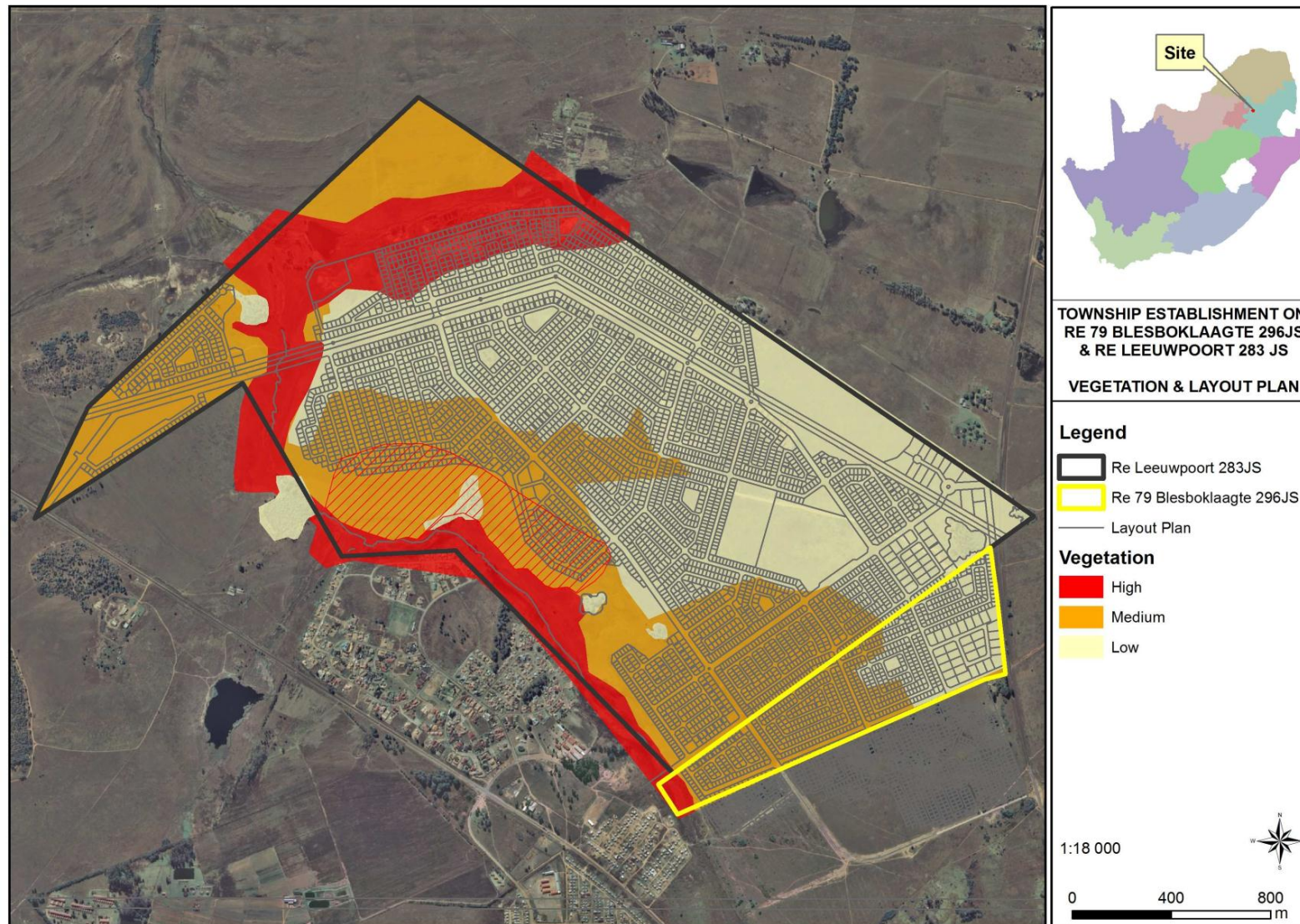


Figure 23: Vegetation sensitivity map of the project site

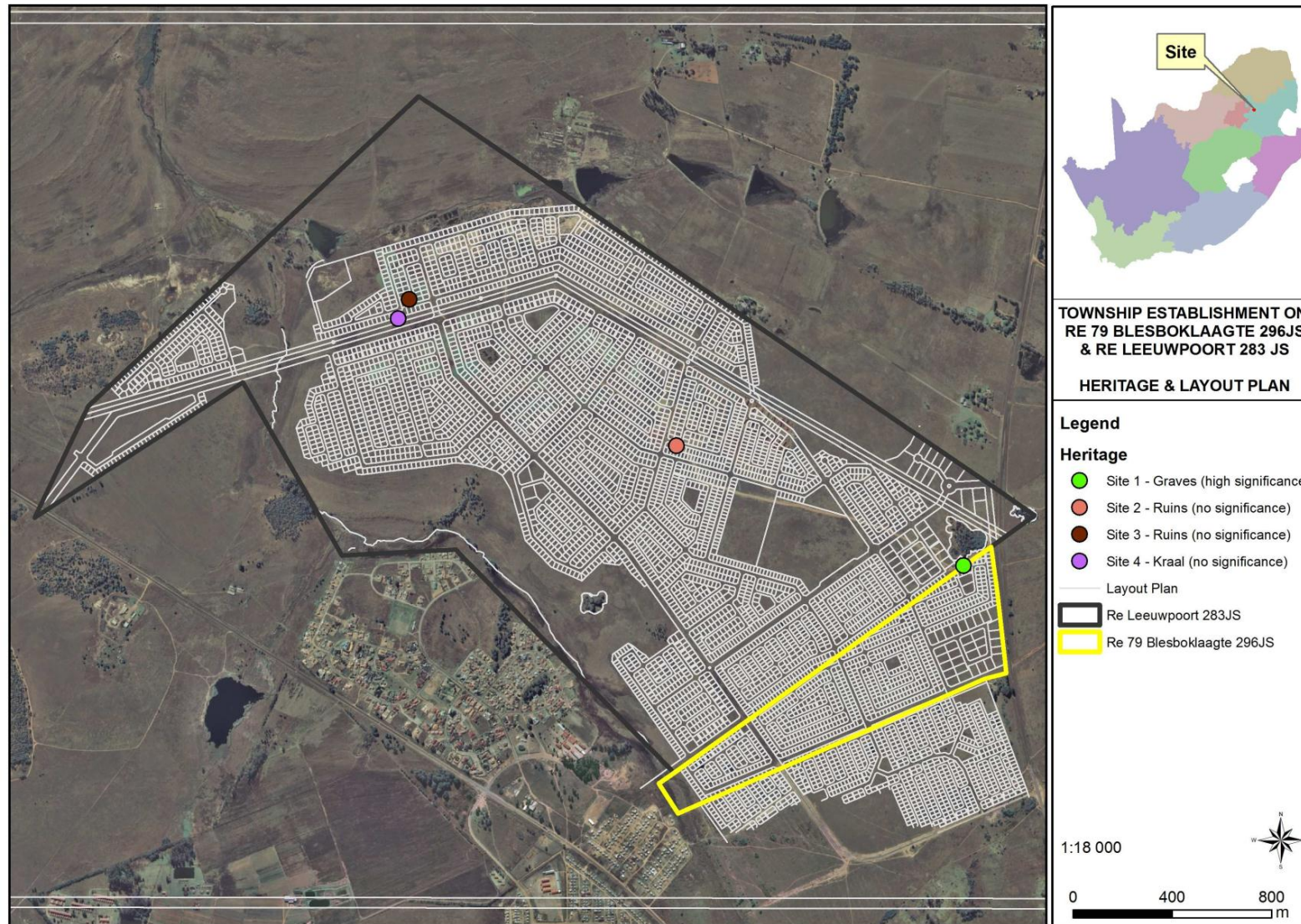


Figure 24: Heritage sensitivity map of the project site

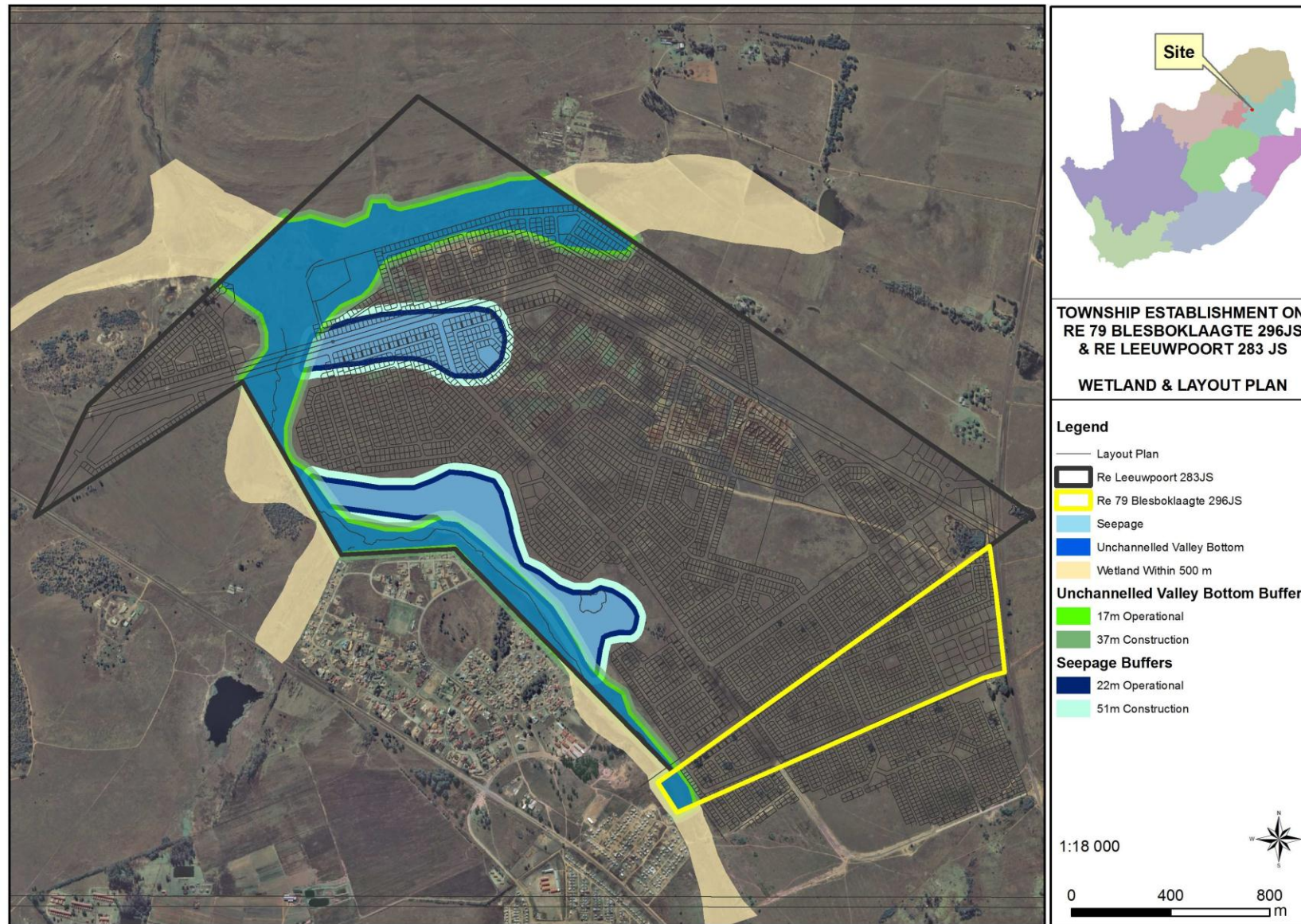


Figure 25: Wetland sensitivity map of the project site

10.3 Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives

The following main positive and potential negative impacts and risks have been identified for the proposed project:

Positive impacts

- Generation of a large number of job opportunities.
 - Stimulation of the economy and housing sector.
- Loss of exotic species, declared weeds and invader plants.

Potential negative impacts

- Changing the quantity and fluctuation properties of the watercourse by, for example, restricting water flow or increasing flood flows.
- Changing the amount of sediment entering water resource and associated change in turbidity (increasing or decreasing the amount).
- Introduction and spread of alien vegetation.
- Changes in water quality due to pollution.
- Increased surface water runoff due to hardened surfaces.
- Increased erosion and sedimentation.
- Potential sewage spillages.
- Pollution of surface and/or groundwater resources due to the potential release of pollutants, such as chemicals, especially during the construction phase.
- Pollution of surface and/or groundwater resources due to the potential release of wastewater (sewage) during the operational phase.
- Pollution of surface and/or groundwater resources due to poor waste management.
- Pollution of surface and/or groundwater resources due to the incorrect management of chemical substances (fuels, oils etc.).
- Unsustainable utilisation of water.
- Pollution of surface and/or groundwater resources due to the runoff of contaminated stormwater.
- Loss of ecological sensitive and important vegetation units.
- Loss of ecosystem function (e.g. reduction in water quality, soil pollution).
- Loss of faunal habitat.
- Loss/displacement of threatened or protected fauna.
- Destruction of natural rocky vegetation, in particular the rocky ridge, and deterioration of rocky grassland.
- Destruction of plant species that are 'Declining', 'Rare' or 'Provincially protected'.
- Destruction of moist grassland and deterioration of the vegetation associated with moist grasslands.
- Possible increase in exotic and invasive vegetation.
- Loss of the ecological function of the moist grasslands.
- Deterioration of natural vegetation and eventual loss of rocky grassland.
- Possible increase in exotic and invasive vegetation.
- Disturbance or destruction of cultural and heritage resources.
- Generation of dust.
- Release of vehicle emissions from construction vehicles.
- Generation of nuisance and noise.
- Construction of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.: The current arable, grazing or wilderness land capability will cease completely until the structures are removed

(which is not foreseen). The current land uses such as grazing will cease completely until the structures are removed (which is not foreseen).

- Possible contamination of soil by spillages of fuel or oil by mechanical equipment: The soil's physical and chemical properties will be adversely affected and will cause some reduction in land capability.
- Possible soil erosion at exposed building footprints due to higher runoff: Soil erosion will adversely affect land capability.
- Use and maintenance of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.: The pre-construction land capability at areas covered by concrete, tar or paving will remain ceased.
- The construction of structures that cover the soil surface by means of concrete, tar or paving: Compaction of the soil surface for building foundations, parking areas etc. will alter the soil's physical properties negatively.
- Covering the soil surface with concrete, tar or paving will cause productive functioning of the soil to cease completely.
- Possible contamination of soil by spillages of fuel or oil by mechanical equipment: Soil physical and chemical properties will be adversely affected.
- Possible soil erosion at exposed building footprints due to higher runoff: Possible soil erosion at exposed construction sites where the current natural vegetation were removed.
- Use and maintenance of residential units, shopping complexes, industrial complexes, stores, vehicle parking areas, roads etc.: All impacts on soils during the construction phase will remain during the operational phase. The productive functioning of soil at areas covered by concrete, tar or paving will remain ceased.
- Soil pollution from the mixing of concrete.
- Potential increase in crime due to the influx of workers, especially during the construction phase.
- Increase in traffic volumes to the site during both the construction and operational phases.

10.4 Impact management measures from specialist reports and the recording of the proposed impact management outcomes for the development, for inclusion in the EMPr

The impact management measures that have been provided in the various specialist reports have been included under Section 9.10 of this report and have also been included under Section 8.1 of the Environmental Management Programme.

10.5 The final proposed alternatives which respond to the impact management measures, avoidance and mitigation measures identified through the assessment

The final property alternative for the Township Establishment on the Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS and Portion 0 (remaining extent) of the farm Leeuwpoot 283 JS, Mpumalanga is on the following properties (collectively known as the proposed development site):

- The Remaining Extent of Portion 79 of the farm Blesboklaagte 296 JS; and
- Portion 0 (remaining extent) of the farm Leeuwpoot 283 JS

The final site-; layout-; routing; and scale and magnitude alternatives for the proposed project are shown on the following figure (*Figure 26*).



Figure 26: Site Development Plan

10.6 Aspects which were conditional to the findings of the assessment either by the EAP or specialists and which are to be included as conditions of authorisation

The following conditions must be included in the Environmental Authorisation, should the proposed development be authorised:

- The mitigation measures contained in the Environmental Management Programme must be implemented during each developmental phase of the proposed project;
- An independent Environmental Control Officer (ECO) must be appointed to audit compliance to the Environmental Management Programme during the construction phase of the proposed development.
- The following wetland buffers must be applied to the proposed development:
 - Unchannelled valley bottom wetlands: Construction phase: 37m; Operational phase: 17m
 - Seepage wetland 1: Construction phase: 51m; Operational phase: 22m
 - Seepage wetland 2: Construction phase: 51m; Operational phase: 22m
- A Water Use Licence or Registration must be obtained for construction within any of the wetland buffer areas.
- The grave site should be protected and a fence should be erected around the grave site.
- A Plant Rescue Plan should be implemented: Where plants of conservation concern or Provincially protected plants are deemed to be under threat from the construction activities, the plants should be removed by a suitably qualified specialist and replanted into suitable open spaces. These plants may only be removed with the permission of the provincial authority.

10.7 Description of assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed

The following assumptions were made during this Environmental Impact Assessment process:

- That all research and reference sources or material is accurate and up to date;
- That the project information, as provided by the applicant, is correct;
- That the specialist opinions are scientifically grounded and accurate; and
- That the proposed development will be operated according to the Environmental Management Programme and in a responsible manner.

The following gaps in knowledge exist:

- Areas of high fauna and vegetation conservation concern should not be developed, but instead should form part of open space, as far as possible.
- The recommendations of the Traffic Impact Assessment may change based on discussions with the relevant authorities regarding the required upgrades and contributions.

10.8 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

It is Labesh's independent and reasoned opinion that the identified and assessed environmental impacts can be mitigated and that an Environmental Authorisation should therefore be issued for the proposed project.

Please refer to Section 10.6 above for conditions that should be included in respect of the Environmental Authorisation.

10.9 Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised

Not applicable. The proposed activity does include operational aspects.

11. ENVIRONMENTAL ASSESSMENT PRACTITIONER UNDERTAKING

I, Lourens de Villiers, hereby confirm the following:

- The correctness of information provided in this Environmental Impact Assessment Report and the Environmental Management Programme;
- The inclusion of all comments and inputs from stakeholders and I&APs;
- The inclusion of inputs and recommendations from the specialist reports, where relevant; and
- Any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs have been included in this report.

I further confirm that I have no business, financial, personal or other interest in the activity or application in respect of which I have been appointed as EAP, in terms of the EIA Regulations, other than fair remuneration for work performed in connection with this application for Environmental Authorisation.

12. DETAILS OF ANY FINANCIAL PROVISION FOR THE REHABILITATION, CLOSURE AND ONGOING POST DECOMMISSIONING MANAGEMENT OF NEGATIVE ENVIRONMENTAL IMPACTS

No financial provisioning applicable to the proposed project.

13. INDICATION OF ANY DEVIATION FROM THE APPROVED SCOPING REPORT, INCLUDING THE PLAN OF STUDY

There have been no deviations from the approved Scoping Report and Plan of Study.

14. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No specific information has been required by the Competent Authority at this stage of the application process.

15. OTHER MATTERS REQUIRED IN TERMS OF SECTION 24(4)(A) AND (B) OF NEMA

At this stage, no other matters to address have been identified or required.