ENVIRONMENTAL IMPACT ASSESSMENT

APPLICATION FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED SHOPPING CENTRE DEVELOPMENT ON A PORTION OF ERF 440 AND A PORTION OF ERF 488, BRENTWOOD EXTENSION 1 WITHIN THE CITY OF EKURHULENI

GAUTENG DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT (GDARD): TBC

DRAFT BASIC ASSESSMENT REPORT

Prepared in Terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), Environmental Impact Assessment Regulations of 2014, as Amended

Prepared on behalf of:

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Fontenriet
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For review and approval by:

GAUTENG DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT
Administration Unit of the Sustainable Utilisation of the Environment (SUE) Branch
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APRIL 2021

A Report Compiled by:

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Date	April 2021	
Document Title	**DRAFT BASIC ASSESSMENT REPORT**: Application for Environmental Authorisation for the Proposed Shopping Centre Development on A Portion of Erf 440 and A Portion of Erf 488, Brentwood Extension 1 within the City of Ekurhuleni	
Proponent / Applicant	Summit Property Company (Pty) Ltd	**Summit Property Company (Pty) Ltd** PO Box 10371, Fontenriet, 1464 Contact Person: Natalie Phelps / Costa Hadjimarkos Tel: 011 615 1967 E-mail: Costa@summitproperties.co.za admin@summitproperties.co.za
The Competent Authority	Gauteng Department of Agriculture and Rural Development	**Administration Unit of the Sustainable Utilisation of the Environment (SUE) Branch** 56 Eloff Street Umnotho House Johannesburg 2001 Tel: (011) 240 2500
Authority Reference Number		**TBC**
Environmental Assessment Practitioner	Delron Consulting (Pty) Ltd delron ENVIRONMENTAL assessment practitioners	P.O. Box 177 Woodlands 0072 Tel: 082 571 5396 Fax: 086 588 4242 E-mail: pieter@delron.co.za
Revision Number:	#1	
Prepared / Checked by:	P De Lange	
Approved:	Mr. P De Lange BL (UP) Pr LArch SACLAP	
Signature:		

Undertaking by the EAP

I, **Pieter De Lange**, working as an EAP for Delron Consulting (Pty) Ltd declare that:

- All work undertaken relating to the proposed project was done as an independent consultant;
- I have the necessary expertise to conduct EIAs, including the required knowledge and understanding of any guidelines or policies that are relevant to the proposed activity;
- I have undertaken all the work and associated studies in an objective manner, even if the findings of these studies were not favourable to the project proponent;
- I have no vested interest, financial or otherwise, in the proposed project or the outcome thereof, apart from fair remuneration for the work undertaken;
- I have no vested interest, including any conflicts of interest, in either the proposed project or the studies conducted in respect of the proposed project, other than complying with the relevant required regulations;
- I have disclosed all material information in my possession that may have the potential to influence the competent authority's decision and/or objectivity in terms of any reports, plans or documents related to the proposed project as required by the regulations; and
- I have included all comments and inputs provided by the Interested and Affected Parties during the Public Participation Process in this Basic Assessment Report.

Signed at **Pretoria** on this **14** day of **April** of **2021**.

Signature: 

Company: Delron Consulting (Pty) Ltd.

APPLICATION FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED SHOPPING CENTRE DEVELOPMENT ON A PORTION OF ERF 440 AND A PORTION OF ERF 488, BRENTWOOD EXTENSION 1 WITHIN THE CITY OF EKURHULENI

BASIC ASSESSMENT REPORT

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GLOSSARY OF TERMS

Activity	An activity identified in any notice published by the minister or MEC in terms of Section 24D(1)(a) of the Act as a listed activity or specified activity.
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: (a)The property on which or location where it is proposed to undertake the activity; (b) The type of activity to be undertaken; (c) The design or layout of activity; (d) The technology to be used in the activity; and (e) The operational aspects of the activity.
Applicant	The project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.
Biodiversity	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.
Buffer zone	Is a collar of land that filters out inappropriate influences from surrounding activities, also known as edge effects, including the effects of invasive plant and animal species, physical damage and soil compaction caused by trampling and harvesting, abiotic habitat alterations and pollution.
Construction	Means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.
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 Aspects	Elements of an organization's activities, products or services that can interact with the environment.
Environmental Assessment Practitioner (EAP)	The individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.
Environmental Degradation	Refers to pollution, disturbance, resource depletion, loss of biodiversity, and other kinds of environmental damage; usually refers to damage occurring accidentally or intentionally as a result of human activities.

Environmental Impact Assessment (EIA)	The process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR.
Environmental Impact	A change to the environment (biophysical, social and / or economic), whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.
Environmental Issue	A concern raised by a stakeholder, interested or affected parties about an existing or perceived environmental impact of an activity.
Environmental Management Programme (EMP)	A document that provides procedures for mitigating and monitoring environmental impacts, during the construction, operation and decommissioning phases.
Fatal Flaw	Issue or conflict (real or perceived) that could result in developments being rejected or stopped.
Indigenous	Means a species that occurs, or has historically occurred, naturally in a free state within the borders of South Africa. Species that have been introduced to South Africa as a result of human activity are excluded (South Africa (Republic) National Environmental Management: Biodiversity Act, 2004: Chapter 1).
Interested and Affected Party	Any person, group of persons or organization interested in or affected by an activity contemplated in an application, or any organ of state that may have jurisdiction over any aspect of the activity.
Land Use	The various ways in which land may be employed or occupied. Planners compile, classify, study and analyse land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirements, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.
Mitigate	The implementation of practical measures designed to avoid, reduce or remedy adverse impacts or enhance beneficial impacts of an action.
Public Participation Process	A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.
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.
Significance	Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic).
Species of Conservation Concern	Species that have a high conservation importance in terms of preserving South Africa's high biological diversity. If a subpopulation of a species of conservation concern is found to occur

	on a proposed development site, it would be one indicator that development activities could result in significant loss of biodiversity.
Watercourse	a) A river or spring; b) A natural channel in which water flows regularly or intermittently; c) A wetland, lake or dam into which, or from which, water flows, and d) Any collection of water which the Minister may, by notice in the Gazette, declare to be watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.
Wetland	It is a land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem. Primarily, the factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation that is adapted to its unique soil conditions. Wetlands consist primarily of hydric soil, which supports aquatic plants.

ABBREVIATIONS

BAR	Basic Assessment Report
BID	Background Information Document
CBA	Critical Biodiversity Area
CRR	Comments and Responses Report
DBAR	Draft Basic Assessment Report
DEFF	Department of Environment, Forestry and Fisheries
DEIR	Draft Environmental Impact Report
DMR	Department of Mineral Resources
DSR	Draft Scoping Report
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPSA	Interim Certification Board of the Environmental Assessment Practitioners of South Africa
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Programme
EMS	Environmental Management System
FEIR	Final Environmental Impact Report
FSR	Final Scoping Report
GA	General Authorisation
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographical Information System
GN	Government Notice
ha	Hectare
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party

IDP	Integrated Development Plan
IWULA	Integrated Water Use License Application
MAR	Mean annual rainfall
MPRDA	Minerals & Petroleum Resources Development Act (Act 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:AQA	National Environmental Management Act: Air Quality Act, 2004 (Act 39 of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
NWA	National Water Act, 1998 (Act 36 of 1998)
PoS	Plan of Study
PPP	Public Participation Process
RSDF	Regional Spatial Development Framework
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SIA	Social Impact Assessment
SR	Scoping Report
TIA	Traffic Impact Assessment
ToR	Terms of Reference
VIA	Visual Impact Assessment
WML	Waste Management License
WWTW	Wastewater Treatment Works

GAUTENG PROVINCE
AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA

Basic Assessment Report in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014 (Version 1)

Kindly note that:

1. This **Basic Assessment Report** is the standard report required by GDARD in terms of the EIA Regulations, 2014.

2. This application form is current as of 8 December 2014. It is the responsibility of the EAP to ascertain whether subsequent versions of the form have been published or produced by the competent authority.

3. **A draft Basic Assessment Report must be submitted, for purposes of comments within a period of thirty (30) days, to all State Departments administering a law relating to a matter likely to be affected by the activity to be undertaken.**

4. **A draft Basic Assessment Report (1 hard copy and two CD's) must be submitted, for purposes of comments within a period of thirty (30) days, to a Competent Authority empowered in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended to consider and decide on the application.**

5. Five (5) copies (3 hard copies and 2 CDs-PDF) of the final report and attachments must be handed in at offices of the relevant competent authority, as detailed below.

6. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.

7. Selected boxes must be indicated by a cross and, when the form is completed electronically, must also be highlighted.

8. An incomplete report may lead to an application for environmental authorisation being refused.

9. **Any report that does not contain a titled and dated full colour large scale layout plan of the proposed activities including a coherent legend, overlain with the sensitivities found on site may lead to an application for environmental authorisation being refused.**

10. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the application for environmental authorisation being refused.

11. No faxed or e-mailed reports will be accepted. Only hand delivered or posted applications will be accepted.

12. Unless protected by law, and clearly indicated as such, all information filled in on this application will become public information on receipt by the competent authority. The applicant/EAP must provide any interested and affected party with the information contained in this application on request, during any stage of the application process.

13. Although pre-application meeting with the Competent Authority is optional, applicants are advised to have these meetings prior to submission of application to seek guidance from the Competent Authority.

DEPARTMENTAL DETAILS

Gauteng Department of Agriculture and Rural Development
Attention: Administrative Unit of the of the Environmental Affairs Branch
P.O. Box 8769
Johannesburg
2000

Administrative Unit of the of the Environmental Affairs Branch
Ground floor Diamond Building
11 Diagonal Street, Johannesburg

Administrative Unit telephone number: (011) 240 3377 Department central telephone number: (011) 240 2500

(For official use only)

NEAS Reference Number:						
File Reference Number:						
Application Number:						
Date Received:						

If this BAR has not been submitted within 90 days of receipt of the application by the competent authority and permission was not requested to submit within 140 days, please indicate the reasons for not submitting within time frame.

Not Applicable

Is a closure plan applicable for this application and has it been included in this report? **No**

if not, state reasons for not including the closure plan.

Not Applicable

Has a draft report for this application been submitted to a competent authority and all State Departments administering a law relating to a matter likely to be affected as a result of this activity? **Yes**

Is a list of the State Departments referred to above attached to this report including their full contact details and contact person? **Yes**

Refer to **Appendix E.9**

If no, state reasons for not attaching the list.

Not Applicable

Have State Departments including the competent authority commented? **Yes**

If no, why?

Not Applicable

SECTION A: ACTIVITY INFORMATION

1. PROPOSAL OR DEVELOPMENT DESCRIPTION

1.1 Project Title (must be the same name as per application form):

Application for Environmental Authorisation for the Proposed Shopping Centre Development on A Portion of Erf 440 and A Portion of Erf 488, Brentwood Extension 1 within the City of Ekurhuleni

1.2 Development Description

1.1 Project Locality

As shown in Figures 1A and 1B, the site is located on the south-eastern corner of the existing signalised T-intersection between Great North Road (R23/ P40-1) and Celia Nestadt Road. The site is therefore bounded by Great North Road to the west and by Celia Nestadt Road to the north.

1.2 Proposed Development

The subject site comprises of a Portion of Erf 440 and Erf 488, Brentwood Extension 1, which as a whole is approximately 5 ha in extent. It is proposed to consolidate the two erven in order to enable the single shopping centre development. It has become the intention of the developer to develop a reduced shopping centre with a maximum extent of about 9,500 m² GLA. The proposed shopping centre will be the size of a typical neighbourhood centre.

The centre will cater for the surrounding residential areas, but which is also expected to attract some of the passing traffic, especially from Great North Road.

In terms of the current zoning, the following can be noted:

- Portion of Erf 440, Brentwood Ext 1: The current zoning is “Residential 3”. It is proposed to rezone the site to “Special” in order to develop the proposed shopping centre.
- Erf 488, Brentwood Ext 1: This site already has business rights, which would allow for shops.

It is the intension to consolidate the two erven with the rezoning. To note is that due to the flood lines and environmentally sensitive areas, only a portion of the 5 ha site can be developed, and which would limit the developer to the 9,500m² GLA, especially if one takes account of the space required for the parking.

A provisional Site Development Plan (SDP) of the architect is shown in Figure 2 and Appendix C.

1.3 Environmental Assessment Practitioner

Delron Consulting (Pty) Ltd have been appointed to undertake the Basic Assessment process in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) for the proposed development on the subject property.

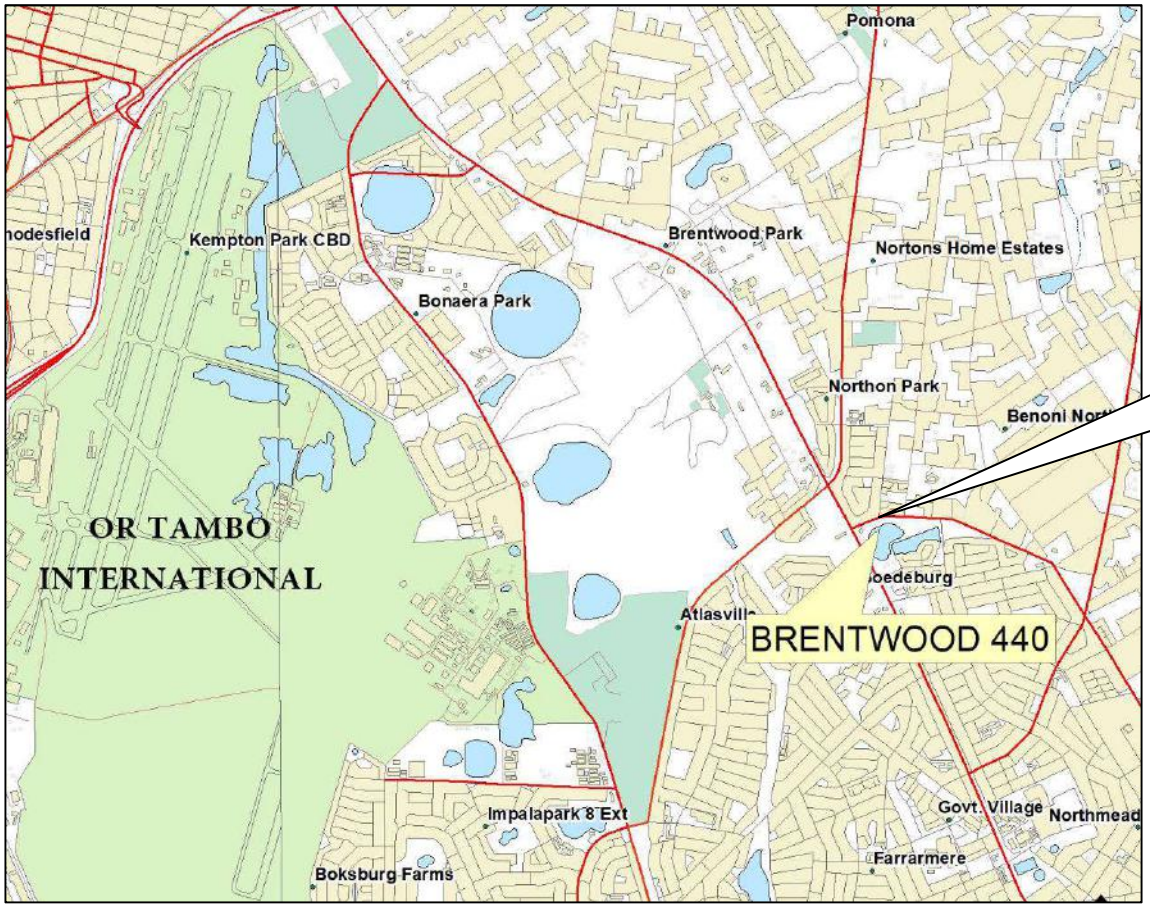
1.4 Requirement for a Basic Assessment Process

In terms of sections 24(2) and 24D of the National Environmental Management Act (Act No. 107 of 1998), as read with the Environmental Impact Assessment (EIA) Regulations of GNR 982 to R985 (as amended 07 April 2017 (GNR 326), a Basic Assessment process is required for the proposed project. Table 1 contains the listed activities in terms of the EIA Regulations and includes a description of those project activities which relate to the applicable listed activities.

Table 1: NEMA EIA Regulations, 2014 (As Amended)-Listed Activities to be Authorised for the Proposed Project

Number of the relevant Government Notice:	Activity No (s)	Listed Activity Description
GNR 983 (LN1) of 2014 (as amended by GNR 327 of 07 April 2017)	19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; …
GNR 983 (LN1) of 2014 (as amended by GNR 327 of 07 April 2017)	27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, …
GNR 985 (LN3) of 2014 (as amended by GNR 324 of 07 April 2017)	4(c)(iv)	The development of a road wider than 4 metres with a reserve less than 13,5 metres. (c) In Gauteng in (iv) Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans.
GNR 985 (LN3) of 2014 (as amended by GNR 324 of 07 April 2017)	12(c)(ii)	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 plan. (c) In Gauteng in (ii) Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans.
GNR 985 (LN3) of 2014 (as amended by GNR 324 of 07 April 2017)	14 (ii) (a)(c)(c)(iv)	The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs - (a) within a water course; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; (c) In Gauteng in (iv) Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans.

The above listed activity has triggered a **Basic Assessment Process**, this activity may not commence without an environmental authorisation from the competent Authority.



The preferred site for the proposed shopping centre development is located at co-ordinates 26° 8'21.41"S and 28°17'46.28"E, on Erven 440 and 488 of Brentwood Extension 1. According to the Ekurhuleni Town Planning Scheme, 2014 Erf 488, Brentwood Extension 1 is zoned "Business 2" and Erf 440, Brentwood Extension 1 is zoned "Residential 3".

Figure 1A: Locality Plan

Figure 1B: Locality Plan

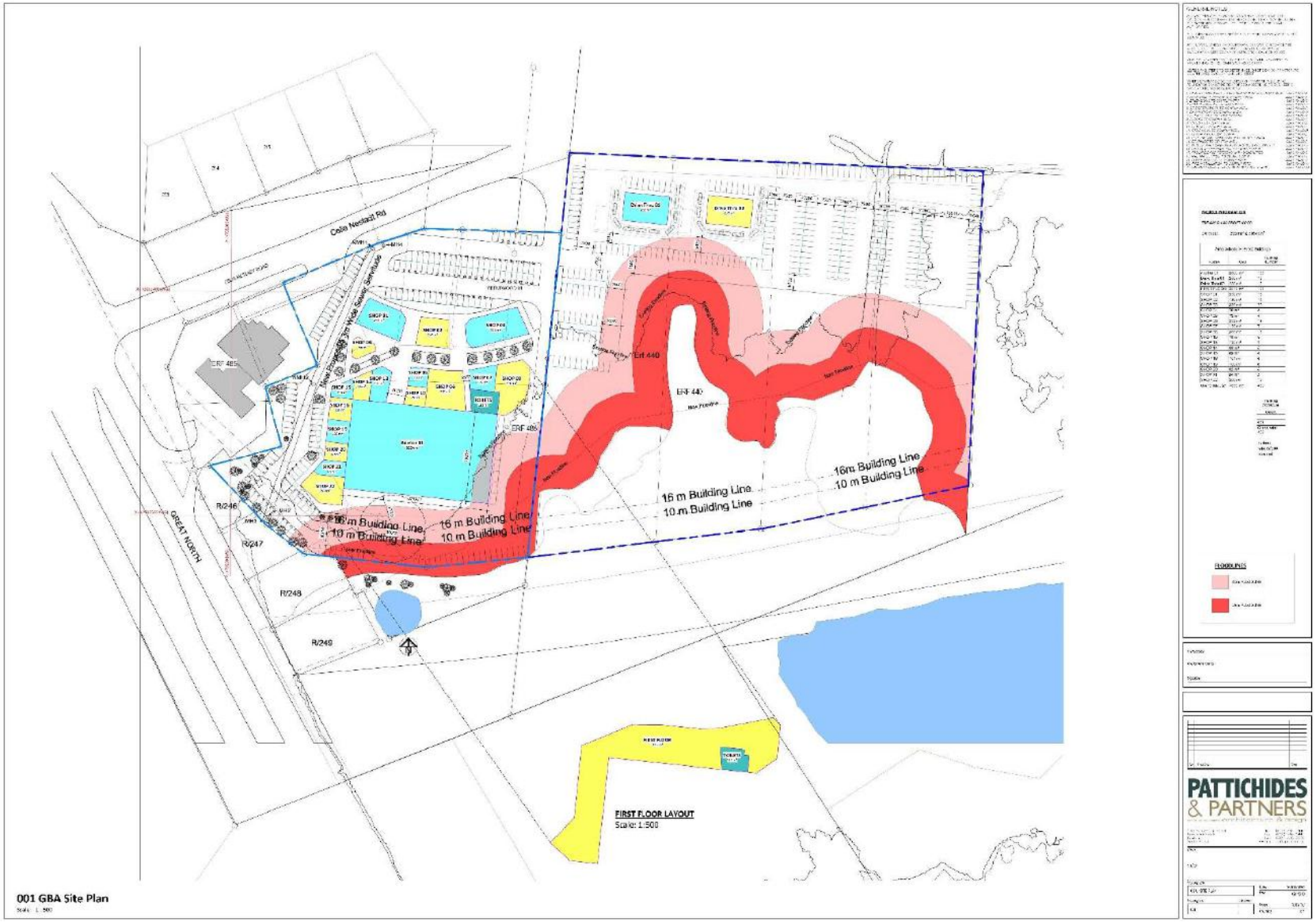


Figure 2: Proposed Site Development Plan

Select the appropriate box

The application is for an upgrade of an existing development	n/a	The application is for a new development	X	Other, specify	n/a

Does the activity also require any authorisation other than NEMA EIA authorisation?

YES X	~~NO~~

If yes, describe the legislation and the Competent Authority administering such legislation

A Water Use License will be applied for, for impeding and diverting the flow of a water course (Section 21 (c)) and altering the bed, banks, course and characteristics of a watercourse (Section 21(i)) for the construction of the shopping centre and associated infrastructure within the 1:100 year flood line regulated area.	Department of Water and Sanitation (DWS)

If yes, have you applied for the authorisation(s)?	YES X	~~NO~~
If yes, have you received approval(s)? (attach in appropriate appendix)	In Process	

2. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations:

Title of legislation, policy or guideline:	Administering authority:	Date:
Constitution of the Republic of South Africa (108 of 1966)	National, Provincial and Local Government	1996
National Environmental Management Act No 107 of 1998 (as amended)	Department of Environment, Forestry and Fisheries (DEFF)	1998
Promotion of Access to Information Act, 2000 (Act No. 2 of 2000 as amended)	National Government - Department of Justice and Constitutional Development	2000
National Environmental Management Biodiversity Act (NEMBA: Act 10 of 2004))	Department of Environment, Forestry and Fisheries (DEFF)	2004
The National Forest Act (Act 84 of 1998)	Department of Agriculture	1998
The National Environmental Management: Protected Areas Act (Act No.57 of 2003)	Department of Environment, Forestry and Fisheries (DEFF)	2003
The National Water Act (Act No. 36 of 1998)	Department of Water Affairs and Sanitation	1998
Conservation of Agricultural Resources Act (Act No. 85 of 1983)	National and Provincial Government	1983
The National Environmental Management: Air Quality Act (Act No. 39 of 2004)	National and Provincial Government	2004
National Heritage Resources Act (Act No. 25 of 1999)	SAHRA	1999
National Environmental Management: Waste Act (Act No. 59 of 2008)	Department of Environment, Forestry and Fisheries (DEFF)	2008
Gauteng Provincial Environmental Management Framework (GPEMF)	GDARD	2018
The Gauteng Conservation Plan (Version 3.3)	GDARD	2011

Description of compliance with the relevant legislation, policy or guidelines:

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)	National Government	1996	The Constitution, which is the supreme law of the Republic of South Africa, provides the legal framework for legislation regulating environmental management in general, against the backdrop of the fundamental human rights. Section 24 of the Constitution states that: *"Everyone has the right:* *a) to an environment that is not harmful to their health or well-being; and* *b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that:* *i. prevent pollution and ecological degradation;*

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
			ii. promote conservation; and *iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."* Section 24 of the Bill of Rights therefore guarantees the people of South Africa the right to an environment that is not detrimental to human health or well-being, and specifically imposes a duty on the State to promulgate legislation and take other steps that ensure that the right is upheld and that, among other things, ecological degradation and pollution are prevented. **Project Applicability** In support of the above rights, the environmental management objectives of proposed project is to protect ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development.
The National Environmental Management Act (Act No. 107 of 1998)	Minister (DEFF) or MEC (provincial authority)	1998	The National Environmental Management Act (Act No. 107 of 1998) (as amended), or otherwise known as NEMA, is South Africa's overreaching environmental legislation and has, as its primary objective, *provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state, and to provide for matters connected therewith*. The principles of the Act are the following: • Environmental management must place people and their needs at the forefront of its concern; • Development must be socially, environmentally and economically sustainable; • Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated; • Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person; • Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued; • The responsibility for the environmental health and safety consequences of a policy, programme, project or activity exists throughout its life cycle; • The participation of all interested and affected parties in environmental governance must be promoted; • Decisions must take into account the interests needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge including traditional and ordinary knowledge; • Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness; • Social, economic and environmental impacts of activities including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment; • The right of workers to refuse work that is harmful to human health or the environment;

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
			• Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law; • There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment; • The environment is held in public trust for the people, the beneficial use of the environment resources must serve the public interest and the environment must be protected as the people's common heritage; • The cost of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment; and • Lastly, that the vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted. **Project Applicability** The mandate for EIA lays with the National Environmental Management Act (107 of 1998) and the EIA Regulations No. 324, 325, 326, and 327 of 7 April 2017 promulgated in terms of Section 24 of NEMA. The EIA Regulations determine that an Environmental Authorisation is required for certain listed activities, which might have a detrimental effect on the environment. This EIA was triggered by the following activities: • GNR 983 (LN1) of 2014 (as amended by GNR 327 of 07 April 2017): Activities 19 and 27; • GNR 985 (LN3) of 2014 (as amended by GNR 324 of 07 April 2017): Activities 4(c)(iv), 12(c)(ii) and 14 (ii)(a)(c)(c)(iv) Written environmental authorisation is required prior to the development of listed activities.
Promotion of Access to Information Act, 2000 (Act No. 2 of 2000 as amended)	National Government - Department of Justice and Constitutional Development	2000	The Promotion of Access to Information Act 2 of 2000 (PAIA) is legislation allowing access to any information held by the State, and any information held by private bodies that is required for the exercise and protection of any rights.
National Environmental Management Biodiversity Act (NEMBA: Act 10 of 2004))	Department of Environment, Forestry and Fisheries (DEFF)	2004	The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for "*the management and conservation of South Africa's biodiversity within the framework of the NEMA, the protection of species and ecosystems that warrant national protection, and the use of indigenous biological resources in a sustainable manner, amongst other provisions*". The Act states that the state is the custodian of South Africa's biological diversity and is committed to respect, protect, promote and fulfil the constitutional rights of its citizens. Furthermore, NEMBA states that the loss of biodiversity through habitat loss, degradation or fragmentation must be avoided, minimised or remedied. The loss of biodiversity includes inter alia the loss of threatened or protected species. Biodiversity offsets are a means of compensating for the loss of biodiversity after all measures to avoid, reduce or remedy biodiversity loss have been taken, but residual impacts still remain and these are predicted to be medium to high.

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
			Chapter 5 of NEMBA (Sections 73 to 75) regulates activities involving invasive species, and lists duty of care as follows: • the land owner/land user must take steps to control and eradicate the invasive species and prevent their spread, which includes targeting offspring, propagating material and regrowth, in order to prevent the production of offspring, formation of seed, regeneration or re-establishment; • take all required steps to prevent or minimise harm to biodiversity; and • ensure that actions taken to control/eradicate invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. An amendment to the NEMBA has been promulgated, which lists 225 threatened ecosystems based on vegetation types present within these ecosystems. Should a project fall within a vegetation type or ecosystem that is listed, actions in terms of NEMBA are triggered. **Project Applicability** Based on the specialist Terrestrial Biodiversity Impact Assessment undertaken for the proposed site, none of the threatened ecosystems occur within the study area.
The National Forest Act (Act 84 of 1998)	Department of Agriculture	1998	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that; *'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.* In essence the National Forests Act (NFA) prohibits the destruction of indigenous trees in any natural forest without a license. In terms of the NFA and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 [Act No. 122 of 1984] for protected tree species), the removal, relocation or pruning of any protected plants will require a license. **Project Applicability** Not Applicable - Based on the specialist Terrestrial Biodiversity Impact Assessment undertaken for the proposed site, none of the protected tree species occur within the study area.
The National Environmental Management: Protected Areas Act (Act No.57 of 2003)	Department of Environment, Forestry and Fisheries (DEFF)	2003	Protected areas are a fundamental tool for achieving biodiversity objectives and protecting essential natural heritage areas and ecosystems services, since these often provide greater security for conservation-worthy land than the agreements or land use limitations provided for in the parallel National Environmental Management: Biodiversity Act (NEM:BA). The aim of the National Environmental Management Protected Areas Act (Act No. 57 of 2003) (NEMPA) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a Protected Environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
			Project Applicability Not Applicable - The proposed development does not occur within a Protected Area.
The National Water Act (Act No. 36 of 1998)	Department of Water Affairs and Sanitation	1998	Water use in South Africa is managed through a water use authorisation process, which requires that every water use is authorised by the Department of Water and Sanitation (DWS, previously known as the Department of Water Affairs) or an established Catchment Management Agency (CMA; if applicable for that region), once the water requirements for the Reserve have been determined. The NWA defines a water resource to be a watercourse, surface water, estuary, or groundwater (aquifer). Included under surface water are manmade water channels, estuaries and watercourses. A water use must be licensed unless it (a) is listed in Schedule 1, (b) is an existing lawful use, (c) is permissible under a general authorisation (GA), or (d) if a responsible authority waives the need for a license. **Project Applicability** A Water Use License will be applied for, for impeding and diverting the flow of a water course (Section 21 (c)) and altering the bed, banks, course and characteristics of a watercourse (Section 21(i)) for the construction of the shopping centre and associated infrastructure within the 1:100 year flood line regulated area.
Conservation of Agricultural Resources Act (Act No. 85 of 1983)	National and Provincial Government	1983	The objective of the Act is to provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.
The National Environmental Management: Air Quality Act (Act No. 39 of 2004)	National and Provincial Government	2004	The National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEMAQA) provides for the setting of national norms and standards for regulating air quality monitoring, management and control and describes specific air quality measures so as to protect the environment and human health or well-being by: • Preventing pollution and ecological degradation, and • Promoting sustainable development through reasonable resource use. It also includes the establishment of national ambient dust fall out levels that may be relevant to the construction. **Project Applicability** Not Applicable
National Heritage Resources Act (Act No. 25 of 1999)	SAHRA	1999	The National Heritage Resources Act (Act No. 25 of 1999) was promulgated for the protection of National Heritage Resources and the empowerment of civil society to conserve their heritage resources. **Project Applicability** No heritage sites or features were observed with the proposed project footprint, although artefacts may be uncovered during construction activities.

Policy Context for the Proposed Development

Legislation, policy of guideline	Description of compliance
The Gauteng Conservation Plan (Version 3.3) (GDARD, 2011)	The plan has classified areas within the province on the basis of its contribution to reach the conservation targets within the province. Critical Biodiversity Areas (CBAs) contain irreplaceable, important and protected areas and are areas needed to reach the conservation targets. In addition 'Ecological Support Areas' (ESAs), mainly around riparian areas and other movement corridors were also classified to ensure sustainability in the long term. According to the Gauteng Conservation Plan (C-Plan 3.3), parts of the site are designated as a Critical Biodiversity Area (CBA) AND an "Ecological Support Area". A specialist botanical assessment has been undertaken to assess the potential impacts of the proposed project on vegetation.
Gauteng Provincial Environmental Management Framework (GPEMF)	The subject property is located within a Zone 1: Urban Development Zone of the GPEMF. The intention with Zone 1 is to streamline urban development activities in it and to promote development infill, densification and concentration of urban development within the urban development zones as defined in the Gauteng Spatial Development Framework (GSDF), in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas. Certain currently listed activities may be exempted from environmental assessment requirements at the discretion of the competent authority.
GDARD Requirements For Biodiversity Assessments Version 3	• Minimum requirements for biodiversity studies • Sensitivity mapping rules for biodiversity assessments • Minimum requirements for ecological management plans • Recommended standard mitigatory measures

Guidelines: (Guidelines have informed this Application for Environmental Authorisation procedures and project / BAR):

i. **Companion Guideline on the Environmental Impact Assessment Regulations, 2010**
ii. **Environmental Management Framework Guidelines, 10 October 2012**
iii. **Public Participation Guideline, 10 October, 10 October 2012**
iv. **Fee Regulations Guidance Document, April 2014**
v. **Guideline on need and desirability in terms of the Environmental Impact Assessment Regulations, 2010**
vi. **EIA Listed Activities and Timelines (January 2015)**
vii. **Section 24G and Similar Listings (January 2015)**

3. ALTERNATIVES

Describe the proposal and alternatives that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The determination of whether the site or activity (including different processes etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment.

The no-go option must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. **Do not** include the no go option into the alternative table below.

Note: After receipt of this report the competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

Please describe the process followed to reach (decide on) the list of alternatives below

The following definition of "alternatives" is given in the 2014 EIA Regulations:

"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
(f) includes the option of not implementing the activity.

Typically, alternative assessments are conducted to assist in comparing various projects or attributes of projects that will occur. The most critical comparison is evaluating any proposed project against the No-Go option. The alternatives assessment then considers alternatives to project site selection for the proposed development; alternatives to layout of the development; and alternatives to construction methodologies and/or materials used for the development.

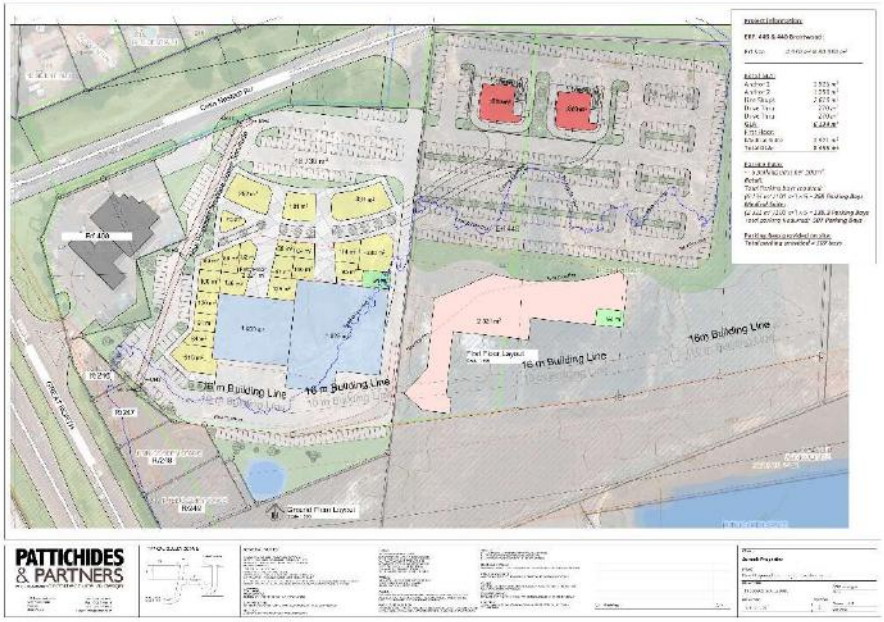
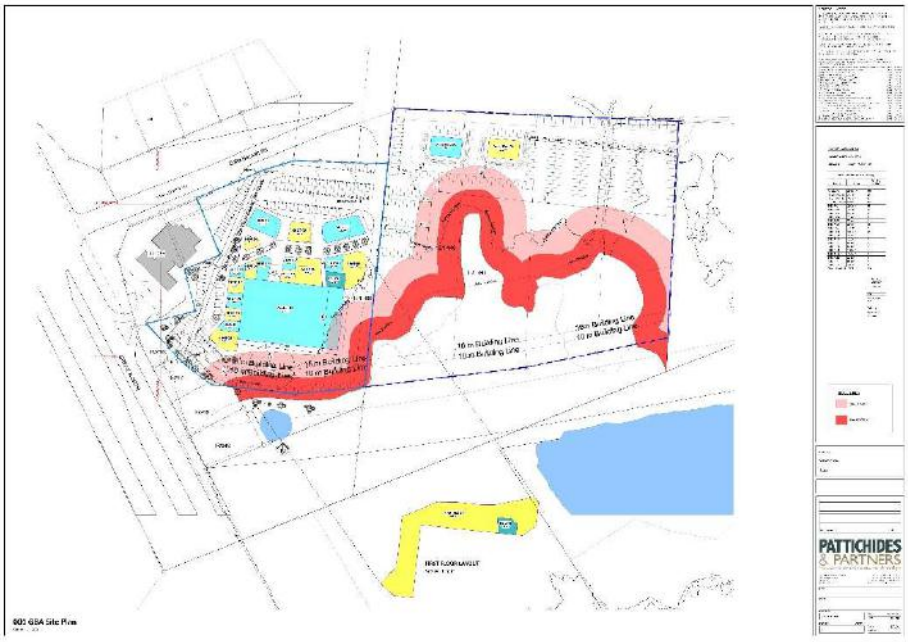
For any alternative to be considered feasible, the alternative must meet the need and purposes of the development proposal without presenting significantly high associated impacts. Alternatives are typically distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and / or Basic Assessment process. Incremental alternatives typically identified arise during the Basic Assessment process and are usually suggested as a means of addressing / mitigating identified impacts (e.g.: waste management, noise reduction measure, contamination management, etc.) These alternatives are closely linked to the identification of mitigation measures and therefore are not specifically identified as distinct alternatives. The types of alternatives considered for this project are presented below.

Provide a description of the alternatives considered

No	Alternative Type	Description
1	**PROPERTY OR SITE ALTERNATIVES**	The preferred site for the proposed shopping centre development is located at co-ordinates 26° 8'21.41"S and 28°17'46.28"E, on Erven 440 and 488 of Brentwood Extension 1. According to the Ekurhuleni Town Planning Scheme, 2014 Erf 488, Brentwood Extension 1 is zoned "***Business 2***" and Erf 440, Brentwood Extension 1 is zoned "***Residential 3***". • **Land Availability**: The subject property is of a suitable size for the proposed shopping centre. The proposal to establish the aforesaid shopping centre pertains only to an area of approximately 2.798 ha on an approximately 4.852 ha piece of land. • **Landowner Willingness**: The owner / applicant owns this property and no others, so alternative sites for development are not available for consideration. • **Spatial Development Policies**: o **Metropolitan Spatial Development Framework, 2011** The Integrated Development Plan (IDP) of a municipality, together with the Spatial Development Framework/s (SDF) forming part thereof are, by virtue of the provisions of section 35 of the Local Government Systems Act 32 of 2000 (the Systems Act), the principle planning instruments which guide and inform all planning and development and all decisions with regard to planning, management and development in the municipality. The MSDF is not a blueprint or master plan, but a framework to give strategic guidance in respect of the location and vision of development within the municipality. In terms of the MSDF, the area in question is earmarked as urban which includes supporting facilities such as churches, home business, business facilities, schools, residential, etc. In view of the aforesaid the proposed development is in line with the MSDF. o **Area 34 Local Spatial Development Framework** According to the Area 34 LSDF, the application site forms part of a mix used corridor zone of which the following land uses are permitted on the application: • Residential buildings, Residential establishment, Community orientated uses, Home undertakings and professional home office, Place of instruction, Place of public worship, Place of refreshments, Institutions, Business buildings, Medical orientated uses and Retail. In view of the aforesaid, it is evident that the proposed rights complies with the Local Spatial Development Framework for the area. The applicant identified the opportunity to develop a shopping centre on the subject property. It was decided to develop the said site due to the following: • It is evident that the proposed rights complies with the Local Spatial Development Framework for the area. • The property was undeveloped.

No	Alternative Type	Description
		• The property is large enough for the activity. • Erf 488, Brentwood Extension 1 is already zoned "Business 2" and the existing land use rights allows for a shopping centre of approximately 26 222 m². The purpose of the rezoning is not to increase the floor area but to spread the existing business rights over Erven 440 and 488, Brentwood Extension 1. By spreading the business rights over two the properties the owner will be able to develop a shopping centre that will be integrated with the environmental sensitive area located on the southern portion as well as providing public transport facilities and appropriate onsite parking. • Easy access to services (water, sewage, electricity, roads, storm water, waste removal). Therefore, no other site alternatives were considered. The present and preferred site is the only one under consideration.
2	**ACTIVITY TYPE ALTERNATIVES**	**<u>Land Use Alternatives</u>** In terms of the zoning, the subject property may only be used for the purposes of a "Business" and "Residential" use. Erf 488, Brentwood Extension 1 is already zoned "Business 2" and the existing land use rights allows for a shopping centre of approximately 26 222 m². The purpose of the rezoning is not to increase the floor area but to spread the existing business rights over Erven 440 and 488, Brentwood Extension 1. By spreading the business rights over two the properties the owner will be able to develop a shopping centre that will be integrated with the environmental sensitive area located on the southern portion as well as providing public transport facilities and appropriate onsite parking. Therefore, no other Land Use alternatives have been considered.
3	**LAYOUT & DESIGN ALTERNATIVES**	**<u>Motivation for the preferred design or layout alternative</u>**. The preferred layout plan was designed by Pattichides & Partners Architects in line with the findings of various technical and specialist reports. The following factors were taken in consideration: • **Flood Lines** A watercourse (natural pan) is located on the eastern portion and a 1:100 year flood line is applicable. The 1:100 year flood line will be taken into consideration in the proposed development and no development will take place within the aforesaid flood line area without a water use license or the necessary authorisation. • **Stormwater Attenuation** It is a requirement for the Ekurhuleni Metropolitan Municipality that stormwater runoff from the site must be retained in such a way that the runoff before development for a 5-year or a 25-year storm be retained after development to restrict the flows to values before development. In the calculations, it was determined that 1100.92 m³ needs to be attenuated on site.

No	Alternative Type	Description
		• **Wetland** The wetland on the property has been variously affected due to anthropogenic influences as described in this specialist report. The area surrounding the wetland is transformed and comprises weeds and alien invasive species mostly. The permanently wet section of the wetland is the only part of the wetland system that has remained relatively natural although sections are degraded. The wetland receives a large amount of its water from three stormwater channels that have been artificially dug. The water is received from the residential developments along the northern boundary of the study area. Due to the infilling the natural topography of the area has been altered permanently. The edge of the wetland is therefore higher than the surrounding terrestrial vegetation area meaning that no surface water flows towards the wetland, but rather into the artificial stormwater channels from where they reach the wetland. GDARD requires a buffer zone of 30m around wetlands. Based on the transformed condition of the buffer zone (comprising infilling, rubble, litter and pioneer weedy and alien invasive species) the 15m buffer zone as determined from the Buffer Tool (DEFF) is recommended on condition that the 15m area is rehabilitated and planted with indigenous species occurring around wetland (see recommendations in this report). It is thought that a rehabilitated 15m buffer zone is more realistic, and it would greatly enhance the total wetland ecosystem and its functioning. A 30m buffer zone would serve no purpose since it would not be feasible to rehabilitate such a large area and topographically it would not serve a function in protecting the wetland system as explained earlier in the report. • **Provincial Roads** According to the Gautrans Strategic Roads Master Plan (2007) the following proposed Provincial Roads are within the vicinity of the application site, namely: o Future K119 (existing Great North Road (P40-1)): Great North Road is located to the west of the site will be upgraded into the future K119. To a large extent the road already functions as a K-route, since it is already a 4-lane dual carriageway road constructed to K-route standards. o Future K86: Immediately to the south of the site, K86 will be a new road on a new alignment. This new road will run east-west to the south of the site. Important to note is that according to the planning of K86, Celia Nestadt Road will be closed off to the east of the current intersection with Great North Road, once the K86 is constructed. **<u>Design</u>** Before commencing with layout design various technical and specialist investigations were conducted to determine the feasibility of the proposed project. The proposed design is based on various team meetings and workshops in order to plan the most efficient and feasible option. Several meetings were held discussing the most feasible options with regards to environmental constraints (wetland), flood lines, bulk services, topography, storm water as well as other constraints i.e. Future K86. Portions of the subject property are not suitable for development due to the wetland, the associated conservation buffer area and future Provincial Road K86.

No	Alternative Type	Description
		Various layout alternatives (refer to figures 3-4 below) were considered.  **Figure 3: Layout Alternative 1**  **Figure 4: Layout Alternative 2** As can be seen, various different design and layout alternatives have been considered and evaluated by the EAP and specialist. The Layout Alternative 2 is the preferred design and layout alternative and is considered the most feasible and appropriate, based on the minimization of environmental risks.
4	**TECHNOLOGY ALTERNATIVES**	Technology alternatives have not been considered at this stage. Consideration of such alternatives can only reasonably considered at the detailed design stage, at which time

No	Alternative Type	Description
		consideration will be given to, but will not necessarily be limited to, the following aspects: high-efficiency windows and insulation in walls, ceilings, and floors, solar water heating, solar external lighting, ultra-low flush toilets and / or dual flush toilet cisterns, energy efficient light bulbs (CFLs), rain water harvesting from roofs and stored for irrigation and energy efficient heating, ventilating and air conditioning systems.
5	**OPERATIONAL ALTERNATIVES**	Not Applicable

In the event that no alternative(s) has/have been provided, a motivation must be included in the table below.

Not Applicable

4. PHYSICAL SIZE OF THE ACTIVITY

Indicate the total physical size (footprint) of the proposal as well as alternatives. Footprints are to include all new infrastructure (roads, services etc), impermeable surfaces and landscaped areas:

	Size of the activity:
Proposed activity ***(Total environmental (landscaping, parking, etc.) and the building footprint)***	**± 2.798 Ha (27 980 m²)**
Alternatives:	
Alternative 1 (if any)	n/a
Alternative 2 (if any)	n/a

Ha / m²

or, for linear activities:

	Length of the activity:
Proposed activity	n/a
Alternatives:	
Alternative 1 (if any)	n/a
Alternative 2 (if any)	n/a

m/km

Indicate the size of the site(s) or servitudes (within which the above footprints will occur):

	Size of the site/servitude:
Proposed activity	**4.852 Ha**
Alternatives:	
Alternative 1 (if any)	n/a
Alternative 2 (if any)	n/a

Ha/m²

5. SITE ACCESS

Proposal

Does ready access to the site exist, or is access directly from an existing road?	**YES X**	~~NO~~
If NO, what is the distance over which a new access road will be built		n/a

Describe the type of access road planned:

The proposed site access will be off Celia Nestadt Road at a location directly opposite the existing T-intersection with Calvinia Road, which is located approximately 230m to the east of the Great North Road and Celia Nestadt Road T-intersection. It is proposed to convert the existing T-intersection to a 4-legged intersection with the new 4th leg providing access to the shopping centre developments. This will be a full access allowing all turning movements to and from the site.

Include the position of the access road on the site plan (if the access road is to traverse a sensitive feature the impact thereof must be included in the assessment).

Alternative 1

Does ready access to the site exist, or is access directly from an existing road?	n/a	n/a
If NO, what is the distance over which a new access road will be built		n/a

Describe the type of access road planned:

n/a

Include the position of the access road on the site plan. (if the access road is to traverse a sensitive feature the impact thereof must be included in the assessment).

Alternative 2

Does ready access to the site exist, or is access directly from an existing road?	n/a	n/a
If NO, what is the distance over which a new access road will be built		n/a

Describe the type of access road planned:

n/a

Include the position of the access road on the site plan. (if the access road is to traverse a sensitive feature the impact thereof must be included in the assessment).

PLEASE NOTE: Points 6 to 8 of Section A must be duplicated where relevant for alternatives

Section A 6-8 has been duplicated **0** Number of times

(only complete when applicable)

6. LAYOUT OR ROUTE PLAN

Refer to Appendix A

A detailed site or route (for linear activities) plan(s) must be prepared for each alternative site or alternative activity. It must be attached to this document. The site or route plans must indicate the following:

- the layout plan is printed in colour and is overlaid with a sensitivity map (if applicable);
- layout plan is of acceptable paper size and scale, e.g.
  - A4 size for activities with development footprint of 10sqm to 5 hectares;
  - A3 size for activities with development footprint of > 5 hectares to 20 hectares;
  - A2 size for activities with development footprint of >20 hectares to 50 hectares);
  - A1 size for activities with development footprint of >50 hectares);
- The following should serve as a guide for scale issues on the layout plan:
  - A0 = 1: 500
  - A1 = 1: 1000
  - A2 = 1: 2000
  - A3 = 1: 4000
  - A4 = 1: 8000 (±10 000)
- shapefiles of the activity must be included in the electronic submission on the CD's;

- the property boundaries and Surveyor General numbers of all the properties within 50m of the site;
- the exact position of each element of the activity as well as any other structures on the site;
- the position of services, including electricity supply cables (indicate above or underground), water supply pipelines, boreholes, sewage pipelines, septic tanks, storm water infrastructure;
- servitudes indicating the purpose of the servitude;
- sensitive environmental elements on and within 100m of the site or sites (including the relevant buffers as prescribed by the competent authority) including (but not limited thereto):

    - Rivers and wetlands;
    - the 1:100 and 1:50 year flood line;
    - ridges;
    - cultural and historical features;
    - areas with indigenous vegetation (even if it is degraded or infested with alien species);

- Where a watercourse is located on the site at least one cross section of the water course must be included (to allow the position of the relevant buffer from the bank to be clearly indicated).

FOR LOCALITY MAP (NOTE THIS IS ALSO INCLUDED IN THE APPLICATION FORM REQUIREMENTS)

- the scale of locality map must be at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map;
- the locality map and all other maps must be in colour;
- locality map must show property boundaries and numbers within 100m of the site, and for poultry and/or piggery, locality map must show properties within 500m and prevailing or predominant wind direction;
- for gentle slopes the 1m contour intervals must be indicated on the map and whenever the slope of the site exceeds 1:10, the 500mm contours must be indicated on the map;
- areas with indigenous vegetation (even if it is degraded or infested with alien species);
- locality map must show exact position of development site or sites;
- locality map showing and identifying (if possible) public and access roads; and
- the current land use as well as the land use zoning of each of the properties adjoining the site or sites.

7. SITE PHOTOGRAPHS

Refer to Appendix B

Colour photographs from the center of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under the appropriate Appendix**.** It should be supplemented with additional photographs of relevant features on the site, where applicable.

8. FACILITY ILLUSTRATION

Refer to Appendix C

A detailed illustration of the activity must be provided at a scale of 1:200 for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity to be attached in the appropriate Appendix.

SECTION B: DESCRIPTION OF RECEIVING ENVIRONMENT

Note: Complete Section B for the proposal and alternative(s) (if necessary)

Instructions for completion of Section B for linear activities

1) For linear activities (pipelines etc) it may be necessary to complete Section B for each section of the site that has a significantly different environment.
2) Indicate on a plan(s) the different environments identified
3) Complete Section B for each of the above areas identified
4) Attach to this form in a chronological order
5) Each copy of Section B must clearly indicate the corresponding sections of the route at the top of the next page.

Section B has been duplicated for sections of the route **n/a** times

Instructions for completion of Section B for location/route alternatives

1) For each location/route alternative identified the entire Section B needs to be completed
2) Each alterative location/route needs to be clearly indicated at the top of the next page
3) Attach the above documents in a chronological order

Section B has been duplicated for location/route alternatives **n/a** times (complete only when appropriate)

Instructions for completion of Section B when both location/route alternatives and linear activities are applicable for the application

Section B is to be completed and attachments order in the following way

- All significantly different environments identified for Alternative 1 is to be completed and attached in a chronological order; then
- All significantly different environments identified for Alternative 2 is to be completed and attached chronological order, etc.

Section B - Section of Route **n/a** (complete only when appropriate for above)

Section B – Location/route Alternative No. **n/a** (complete only when appropriate for above)

1. PROPERTY DESCRIPTION

Property Description: (Including Physical Address and Farm name, portion etc.)	• Proposed Remainder of Erf 440, Brentwood Extension 1 • Proposed Remainder of Erf 488, Brentwood Extension 1

2. ACTIVITY POSITION

Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in decimal degrees. The degrees should have at least six decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

Alternative:	Latitude (S):	Longitude (E):
1. Project Proposal	**-26.139281° or 26° 8'21.41"S**	**28.296189° or 28°17'46.28"E**
2. Alternative 1	n/a	n/a

In the case of linear activities:

1) Project Proposal:

	Latitude (S):	Longitude (E):
• Starting point of the activity	n/a	n/a
• Middle point of the activity	n/a	n/a
• End point of the activity	n/a	n/a

2) Alternative 1:

	Latitude (S):	Longitude (E):
• Starting point of the activity	n/a	n/a
• Middle point of the activity	n/a	n/a
• End point of the activity	n/a	n/a

Alternative 2:

	Latitude (S):	Longitude (E):
• Starting point of the activity	n/a	n/a
• Middle point of the activity	n/a	n/a
• End point of the activity	n/a	n/a

For route alternatives that are longer than 500m, please provide co-ordinates taken every 250 meters along the route and attached in the appropriate Appendix

Addendum of route alternatives attached **n/a**

The 21 digit Surveyor General code of each cadastral land parcel

T	**0**	**I**	**R**	**0**	**1**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**0**	**0**	**0**	**0**	**0**	**0**
T	**0**	**I**	**R**	**0**	**1**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**4**	**4**	**8**	**0**	**0**	**0**	**0**	**0**

3. GRADIENT OF THE SITE

Indicate the general gradient of the site.

~~Flat~~	**1:50 – 1:20 X**	~~1:20 – 1:15 X~~	~~1:15 – 1:10~~	~~1:10 – 1:7,5~~	~~1:7,5 – 1:5~~	~~Steeper than 1:5~~

4. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site.

~~Ridgeline~~	~~Plateau~~	~~Side slope of hill/ridge~~	~~Valley~~	**Plain X**	~~Undulating plain/low hills~~	**River front X**

5. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

A Geotechnical Investigation was undertaken by Geo Buro cc Technical Surveys. The conclusions and recommendations are presented here, and the complete report may be found in **Appendix G.1.**

CONCLUSIONS AND RECOMMENDATIONS

- The regional geology map shows that the site is underlain by residual sandstone of the Vryheid Formation of the Ecca Group of the karoo Supergroup.
- The site is presently largely undeveloped apart from dams in the southern part of the site.
- It is estimated that the maximum amount of movement due to heave is less than 25mm. Indications are that the amount of movement due to the compressibility of the near surface materials will be significant (depending on the loads).
- The foundation design is dependent on the founding levels and the loads of the structure. It is recommended that the foundations be placed on an engineered till and that the in situ material be compacted to address the expected ground movement.
- Excavations (for foundations and underground services) must be inspected on the site during construction.
- The in situ material is not suitable for use in engineered layer works, but is considered suitable for use as fill.
- The TLB occasionally refused on sandstone and hardpan ferricrete.
- A site specific foundation investigation must be done once the site layout is available.

a) Is the site located on any of the following?

Shallow water table (less than 1.5m deep)	**YES X**	~~NO~~
Dolomite, sinkhole or doline areas	~~YES~~	**NO X**
Seasonally wet soils (often close to water bodies)	**YES X**	~~NO~~
Unstable rocky slopes or steep slopes with loose soil	~~YES~~	**NO X**
Dispersive soils (soils that dissolve in water)	~~YES~~	**NO X**
Soils with high clay content (clay fraction more than 40%)	~~YES~~	**NO X**
Any other unstable soil or geological feature	~~YES~~	**NO X**
An area sensitive to erosion	~~YES~~	**NO X**

(Information in respect of the above will often be available at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by Geological Survey may also be used).

b) are any caves located on the site(s)	~~YES~~	**NO X**

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S):	Longitude (E):
n/a	n/a

c) are any caves located within a 300m radius of the site(s)

~~YES~~	**NO X**

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S):	Longitude (E):
n/a	n/a

d) are any sinkholes located within a 300m radius of the site(s)

~~YES~~	**NO X**

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S):	Longitude (E):
n/a	n/a

If any of the answers to the above are "YES" or "unsure", specialist input may be requested by the Department

6. AGRICULTURE

Does the site have high potential agriculture as contemplated in the Gauteng Agricultural Potential Atlas (GAPA 4)?

~~YES~~	**NO X**

Please note: The Department may request specialist input/studies in respect of the above.

7. GROUNDCOVER

To be noted that the location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Indicate the types of groundcover present on the site and include the estimated percentage found on site.

~~Natural veld - good condition~~ ~~% = 0~~	**Natural veld with scattered aliens % = 50**	**Natural veld with heavy alien infestation % = 40**	~~Veld dominated by alien species~~ ~~% = 0~~	~~Landscaped (vegetation)~~ ~~% = 0~~
~~Sport field~~ ~~% = 0~~	~~Cultivated / grazing land~~ ~~% = 0~~	~~Paved surface (hard landscaping)~~ ~~% = 0~~	**Building or other structure / construction activity % = 10%**	~~Bare soil~~ ~~% = 0~~

Please note: The Department may request specialist input/studies depending on the nature of the groundcover and potential impact(s) of the proposed activity/ies.

Specialist Terrestrial Biodiversity Impact Assessment

Enviridi Environmental Consultants (Pty) Ltd was appointed to conduct a specialist Terrestrial Biodiversity Impact Assessment. A summary is presented here, and the complete report may be found in **Appendix G.2.**

The project area is located in the Gauteng Province within the Soweto Highveld Grassland, within the Grassland Biome. The Soweto Highveld Grassland has a status of Vulnerable (VU) in terms of the NBA 2018. However, from the aerial footage it is visible that most of the footprint have been disturbed likely based on the fact that the footprint is on the corner of a busy intersection just east of Johannesburg near Benoni.

From the aerial footage, the site falls on an intersection, but seem to be characterised by areas consisting of grassland and wetland in various degrees of disturbance. From the **Gauteng Environmental Management Zones** (and BGIS), the site falls within **Zone 2**. Zone 2: High control zone (within the urban development zone) – Intention specified as: This zone is sensitive to development activities. Only conservation should be allowed in this zone. Related tourism and recreation activities must be accommodated in areas surrounding this zone.

Within the National Threatened Ecosystems (2011), sections of the site falls within Rietvleiriver Highveld Grassland (GP 7), which has a status of Critically Endangered (CR). This is in contrast with the NBA 2018, indicating the site falls within Soweto Highveld Grassland (as mentioned above, refer to Figure 2 in the report), which has a status of Vulnerable (VU).

The Gauteng C-Plan v3.3 is based on the systematic conservation planning approach (GDARD, 2014). The site is characterised in terms of the Gauteng Conservation Plan (Version 3.3) as a Critical Biodiversity Area (CBA – Important Area), with the surrounding area as Ecological Support Area (ESA). This seems to be based on the fact that some natural vegetation still exists within this zone and associated with wetland terrain and freshwater found just to the south east of the site (within the 200 m buffer). From the data gathered, the site was delineated as possible habitat for Orange listed (OL) plant species and for consisting of natural vegetation.

Flora Baseline: Approximately 444 plant species occur as recorded for the 2628AB QDS (POSA), which consists of 75 families, with the most prominent families recorded from Asteraceae (62 species), Poaceae (58 species), Fabaceae (44 species), Cyperaceae (32 species), Hyacinthaceae (18 species). Thirty-five (35) exotic species and Twenty-six (26) endemic species are known to occur within the larger area Table 4.

Floral species summary for QDS

Number of Families	Number of Species	Endemic	Exotic / Naturalised species
75	444	26	35

Almost all of these species are classified with a "Least Concern" (LC) IUCN status (Appendix A) and is therefore considered at a low risk of extinction and includes widespread and abundant species. However, some species were not classified as LC and could possibly occur within the study area. Species of conservation concern which occur in the 2628AB QDS are listed in Table 5.

Main findings in terms of Legislation (ToPS Listings, Protected Trees and IUCN):

- *Pelargonium sidoides* - Protected
- *Indigofera hybrida* - VU
- *Habenaria bicolor* - NT
- *Gladiolus robertsoniae* - NT
- *Kniphofia typhoides* - NT

Species on SANBI Red list include:

Indigofera hybrida - VU
Habenaria bicolor - NT
Gladiolus robertsoniae - NT
Kniphofia typhoides - NT

Species on the GDARD list include:

Habenaria bicolor - NT
Gladiolus robertsoniae - NT

A total of 27 species of plants enjoy protection from the NTCO including all genera of orchids (*Orchidacea*), all true ferns (Class Polypodiopsida) and all species of *Gladioli*, in addition two (2) Aloe spp. are protected, two (2) *Kniphofia spp*., and two of *Crinum spp*.

The NEMBA category 1b invasive plants species *Cuscuta campestris, Solanum sisymbriifolium* and *Kalanchoe tubiflora* are also known to be found within the QDS along with the category 1a invader species *Iris pseudacorus*. The CARA category 1 weeds namely *Cuscuta campestris*, and *Solanum sisymbriifolium*, along with the category 3 invader *Acacia baileyana*, and the category 2 weed *Acacia dealbata* are known to be found within the area.

Fauna Baseline: Twenty-six (26) mammal species were found to possibly occur within the QDS (ADU), most of which have a Least Concern status. Six (6) species are classified within the National Red Data List of which only two (2) species could possibly occur on-site. These two (2) species as marked above have a small probability to occur on-site, but not likely expected based on the locality on a busy intersection and degraded habitat.

According to data collected during the Southern African Bird Atlas Project 2 (SABAP2), 229 species have been recorded for the specific pentad (2605_2815) where the activities are proposed, and ten (10) species have been indicated to be red listed. Some of these species are also included in the GDARD Orange and Redlist.

Hundred and one (101) butterfly species (Appendix D) were found for the 2628AB, all of which are categorized as Least Concern by SANBI (South Africa Butterfly Conservation Assessment -SABCA 2013). Seven (7) Lacewing species, twenty-six (26) Odonata species and two (2) Scorpion species have been recorded within the area, but none of these species are known to have a red listed status.

Fourteen (14) reptile species were recorded for the QDS and are presented in Appendix D. No red listed species were recorded. The amphibian study conducted was mainly of a desktop nature, gathering information from the Frog Atlas of South Africa. Fourteen (14) species was listed within this QDS and one species were recorded to have a red listed status, but it should be taken into account that the record holds the date of October 2000, which is 20 years ago.

Site Survey Results

Ridges 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. Many Red Data / threatened species of plants and animals inhabit ridges. Due to their threatened status, Red Data species require priority conservation efforts in order to ensure their future survival. As such, the conservation of ridges in Gauteng will contribute significantly to the future persistence of these species.

Slope on an east-to-west elevation average on 1.9 %, with a maximum slope of 3.2 % (Figure 7). Average slope is given as 0.7% within the North-to-South elevation profile of the development area. Maximum slope recorded is provided as 3.7 % (Figure 8). No ridges occur on-site or will be impacted within a 200m perimeter as the buffer as shown consists only of residential areas and no additional natural habitat (besides the dam and natural areas towards the south-east) needs to be surveyed based on this fact.

A site survey was done on the 10th of August 2020. The study area was investigated under the prevailing conditions at the time of the site survey and included late winter conditions. Signs of recent fire were visible across the site. Three broad units were identified and these are as follows:

- Vegetation Unit 1 (VU1): Degraded secondary grassland;
- Vegetation Unit 2 (VU2): Associated Wetland, hydrophytic / riparian vegetation;
- Unit 3 (U3): Mixed and transformed land use associated with the built environment.

Figure 5: Study area delineated into units and habitat available which included a 200 m buffer in red

A total of fifty-five (55) floral species were found to occur within the site and have been divided between the representative units delineated below based on overall composition and distribution. The full list is provided in Appendix C.

Eighteen (18) of the floral species recorded during the site survey are of conservation concern (SCC). Some of these species are classified as invasive vegetation by NEM:BA and others are also classified as either a weed or an invader by CARA.

Thirteen (13) of the Alien and Invasive Plants (AIP) found on the study site are classified as Category 1b invasive plants. Category 1 is the strictest category of species and none of these species are allowed to occur and/or become established on any land area except for the use of a biological control reserve. They possess characteristics that are harmful to humans, animals or the environment. Category 1b is described in NEM:BA as invasive species that may not be owned, imported into

South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove.

Three (3) species found during the field assessment, namely *Acacia decurrens* (Green Wattle), *Populus x canescens* (Grey poplar), and *Acacia dealbata* (Silver wattle) is a Category 2 plant species. Category 2 AIP are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.

Two (2) species found within the study area are classified as Category 3 invaders namely *Morus sp*. (Mullberry) and *Melia azedarach* (Syringa). Category 3 invaders are described NEMBA as invasive species that may not be propagated or grown in any way, conveying or moving or translocating of a specimen categorized as such, selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen, spreading or allowing the spread of any specimen of a listed invasive species, and introduction of a specimen of an alien or a listed invasive species to offshore islands.

Some of the species that were encountered during the field survey have cultural and/or medicinal use. Among the medicinal species, the AIP species *Eucalyptus camaldulensis* found on site may be used for traditional medicine, but this does not exclude them from being invasive and therefore should be treated accordingly.

A total of twelve (12) grass species were found during the field survey, eleven (11) of which can be used to assess the ecological grass status. None of the species found to occur are considered to be "Decreaser" species. Decreaser species are usually highly palatable climax grasses and are good indicators of the veld condition. These species are abundant in good veld, but they tend to decrease when the veld is overgrazed or undergrazed (Van Oudtshoorn, 2014). Most of the grasses are indicated as "Increaser II" species (nine (9) species). Increaser II species are abundant in overgrazed veld. These grasses increase as a result of the disturbing effect of overgrazing. It mostly includes pioneer and subclimax species such as *Eragrostis regidor* due to the fact that these grasses bare many seeds and easily multiply and establish themselves. Only three (3) of the species that occurred is classified as "Increaser I" species. Increaser I species tend to increase in underutilised veld and includes unpalatable climax/subclimax grasses such as *Trachypogon spicatus*.

From a faunal and habitat observation point of view, the area has been largely transformed and only typical urban avifaunal species were sighted during the field assessment. Smaller mammals were also observed (signs and dung), but the faunal community has been vastly impacted and the habitat support offered by this area is seen as very low. Several foot paths were observed during the field assessment based on the fact that humans will utlise the park to cross towards the other side of the road and also remaining fires of informal squatters have been observed. It was also evident that stray dogs currently utilise the area as a hunting ground and several were sighted raiding the wetland terrain during the field assessment. No red listed were sighted or thought to occur due to the degraded nature of the vegetation units and associated habitat.

The wetland and pan associated vegetation unit (VU2) had been rewarded with Medium sensitivity to cater for the sensitivity requirement as possible habitat for sensitive species. The dam within the buffer have been included as Medium Sensitivity, since it is within a residential area on private property and therefore not likely to sustain red listed species, but still constitute important habitat extension for VU2 (ecological corridor). The area is generally thought to be impacted and degraded (and therefore not awarded High sensitivity which is usually awarded to sensitive features such as wetlands and pans) and no signs of red listed species were found to occur.

The artificial channels leading from the road towards the south has been included in VU2 above, but have been separated in the sensitivity analysis and included within the Low sensitivity group below based on the fact that these sections, although

sedges and rushes (hydrophytic vegetation) occur, are artificial in nature and filled with litter. These channels will cease to exist once the stormwater features for this property has been formally designed. It is recommended that once formally designed, clean stormwater be diverted around the property still allowing it to reach the natural environment.

Impacts expected, Risk and Mitigation

Impacts for the development has been assessed and the risk rating has been determined as Medium or Medium-High (without mitigation) and only based on wetland terrain and other pan features found, however, adhering to mitigation measures, the risk will lower towards Medium-Low or Low.

Impacts assessed include amongst other:

- The site is largely degraded and habitat has been transformed, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The wetland associated areas will especially be negatively impacted if not managed well.
- Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas.
- Impacts on the wetland and water resources located downstream of the transformed wetland system. This may be due to pollutants entering the water resource, specifically petroleum related waste products which could possibly spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones.
- Impacts on the wetland and water resources located downstream during and after closure and demolition. However, since shopping centres do not usually have a closure phase, no impacts are predicted.

Mitigation and management measures are prescribed to ensure the least possible impact on the ecology of the area and should be strictly implemented. These include:

- Stilts and other features could be considered for the shopping centre and this will preserve the remaining functioning of the wetland unit where possible, since the wetland is no longer deemed functional and in good ecological health. However, a wetland delineation and specialist investigation should be conducted by a wetland specialist.
- Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary.
- Adhere to all management and mitigation measures as prescribed within the wetland specialist report.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Continuous rehabilitation of the area should occur, immediate closure and rehabilitation of any areas dug during the construction of the stilts and foundations. This will entail the spreading of topsoil, revegetation and management of invasive species.
- Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment, which should include oil traps.

- Implement an Alien and Invasive Management Programme, which will aim to remove and manage the plants recorded during the field survey, since most of these species are already listed on the Alien and Invasive Species list as published in 2016 (Department of Environmental Affairs, 2016).
- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora.
- If possible, find an alternative placement for features of the shopping centre as to prevent placement within a wetland or wetland soils.
- Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment.
- Continuous rehabilitation of the area should occur in accordance with the WUL or if an offset agreement is devised and approved, as well as monitoring as prescribed.

A formal terrestrial management plan has also been included within Section 10.

It's the reasoned opinion of the specialist that the development may continue if all mitigation measures are implemented and all areas of medium or high sensitivity are avoided where feasibly possible. Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as **Medium sensitivity**. The wetland buffers as delineated and recommended by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance.

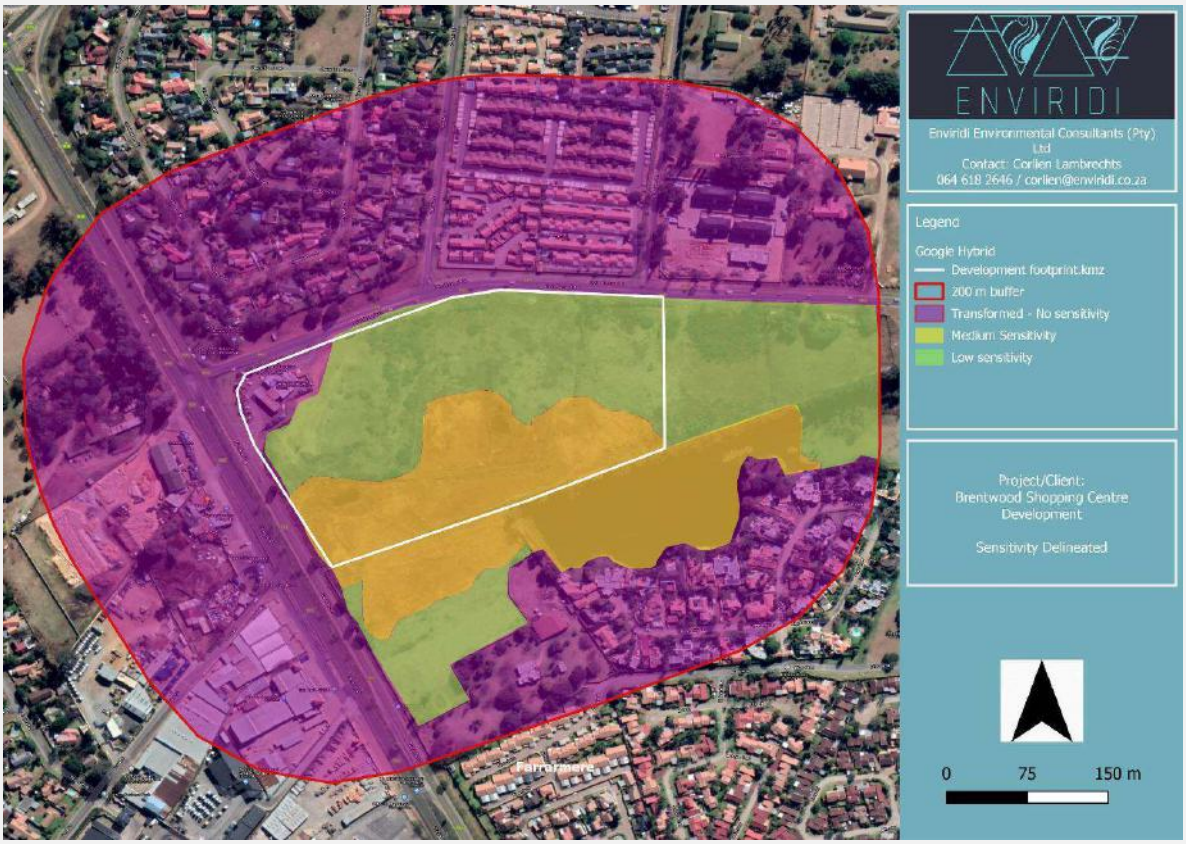


Figure 6: Sensitivity delineated according to habitat remaining condition thereof (Including drainage systems and possible wetlands)

CONSERVATION STATUS - Gauteng Conservation Plan (C-Plan 3.3)

The Gauteng C-Plan v3.3 is based on the systematic conservation planning approach (GDARD, 2014). The site is characterised in terms of the Gauteng Conservation Plan (Version 3.3) as a Critical Biodiversity Area (CBA – Important Area), with the surrounding area as Ecological Support Area (ESA). This seems to be based on the fact that some natural vegetation still exists within this zone and associated with wetland terrain and freshwater found just to the south east of the site (within the 200 m buffer). From the data gathered, the site was delineated as possible habitat for Orange listed (OL) plant species and for consisting of natural vegetation.

The study area is classified as an ESA.

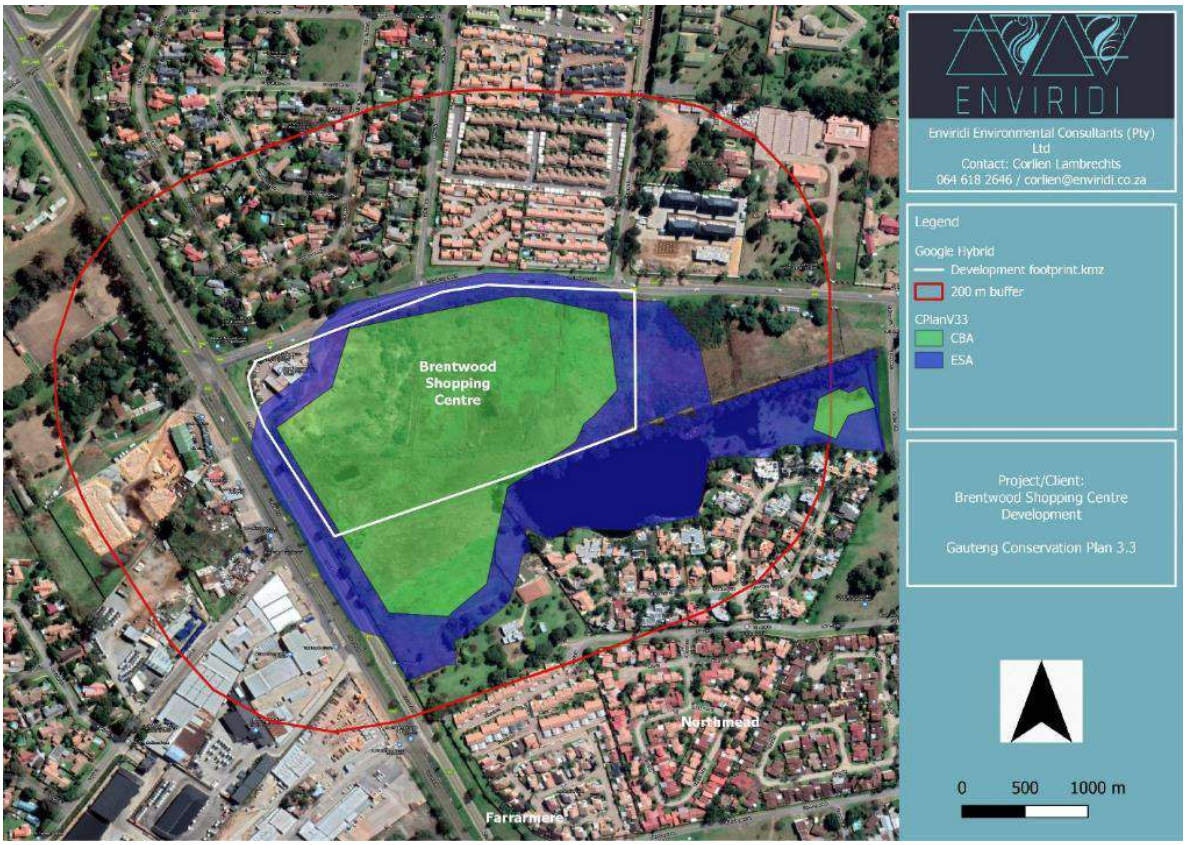


Figure 7: Gauteng Conservation Plan (C-Plan 3.3)

Are there any rare or endangered flora or fauna species (including red list species) present on the site	~~YES~~	**NO X**

If YES, specify and explain:

Not Applicable

Are there any rare or endangered flora or fauna species (including red list species) present within a 200m (if within urban area as defined in the Regulations) or within 600m (if outside the urban area as defined in the Regulations) radius of the site.	~~YES~~	**NO X**

If YES, specify and explain:

Not Applicable

Are there any special or sensitive habitats or other natural features present on the site?	**YES X**	~~NO~~

If YES, specify and explain:
Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as Medium sensitivity. The wetland and pan associated vegetation unit (VU2) had been rewarded with Medium sensitivity to cater for the sensitivity requirement as possible habitat for sensitive species. The dam within the buffer have been included as Medium Sensitivity, since it is within a residential area on private property and therefore not likely to sustain red listed species, but still constitute important habitat extension for VU2 (ecological corridor). The area is generally thought to be impacted and degraded (and therefore not awarded High sensitivity which is usually awarded to sensitive features such as wetlands and pans) and no signs of red listed species were found to occur. The artificial channels leading from the road towards the south has been included in VU2 above, but have been separated in the sensitivity analysis and included within the Low sensitivity group below based on the fact that these sections, although sedges and rushes (hydrophytic vegetation) occur, are artificial in nature and filled with litter. These channels will cease to exist once the stormwater features for this property has been formally designed. It is recommended that once formally designed, clean stormwater be diverted around the property still allowing it to reach the natural environment.

Was a specialist consulted to assist with completing this section			**YES X**	~~NO X~~
If yes complete specialist details				
1. Name of the specialist:	Enviridi Environmental Consultants (Pty) Ltd Ms Corlien Lambrechts			
Qualification(s) of the specialist:	B.Sc. (Hons) Environmental Management, Zoology Pr.Sci.Nat (Reference number: 009135)			
Postal address:	-			
Postal code:	-			
Telephone:	+27 (0)64 618 2646	Cell:	+27 (0)64 618 2646	
E-mail:	corlien@enviridi.co.za	Fax:	-	
Are any further specialist studies recommended by the specialist?			**YES X**	~~NO~~
If YES, specify:	A wetland delineation and specialist investigation should be conducted by a wetland specialist.			
If YES, is such a report(s) attached?			**YES X**	~~NO~~
If YES list the specialist reports attached below				
Dr Andries Gouws & Prof Leslie Brown were appointed to conduct a specialist wetland delineation and specialist investigation. A summary is presented here, and the complete report may be found in Appendix G. **<u>Wetland Boundaries</u>** The soil identified consisted of soils belonging to the Champaign and Katspruit form. These soil types are recognised by the National Water Act (Department of Water and Sanitation) as being a possible wetland. Water saturated portions could clearly be identified from the drone images. The boundaries were then confirmed in the field. Seasonally saturated soils were classified as seeps. The seep on the eastern portion is largely fed from the stormwater drain that enters the site from the northern boundary.				

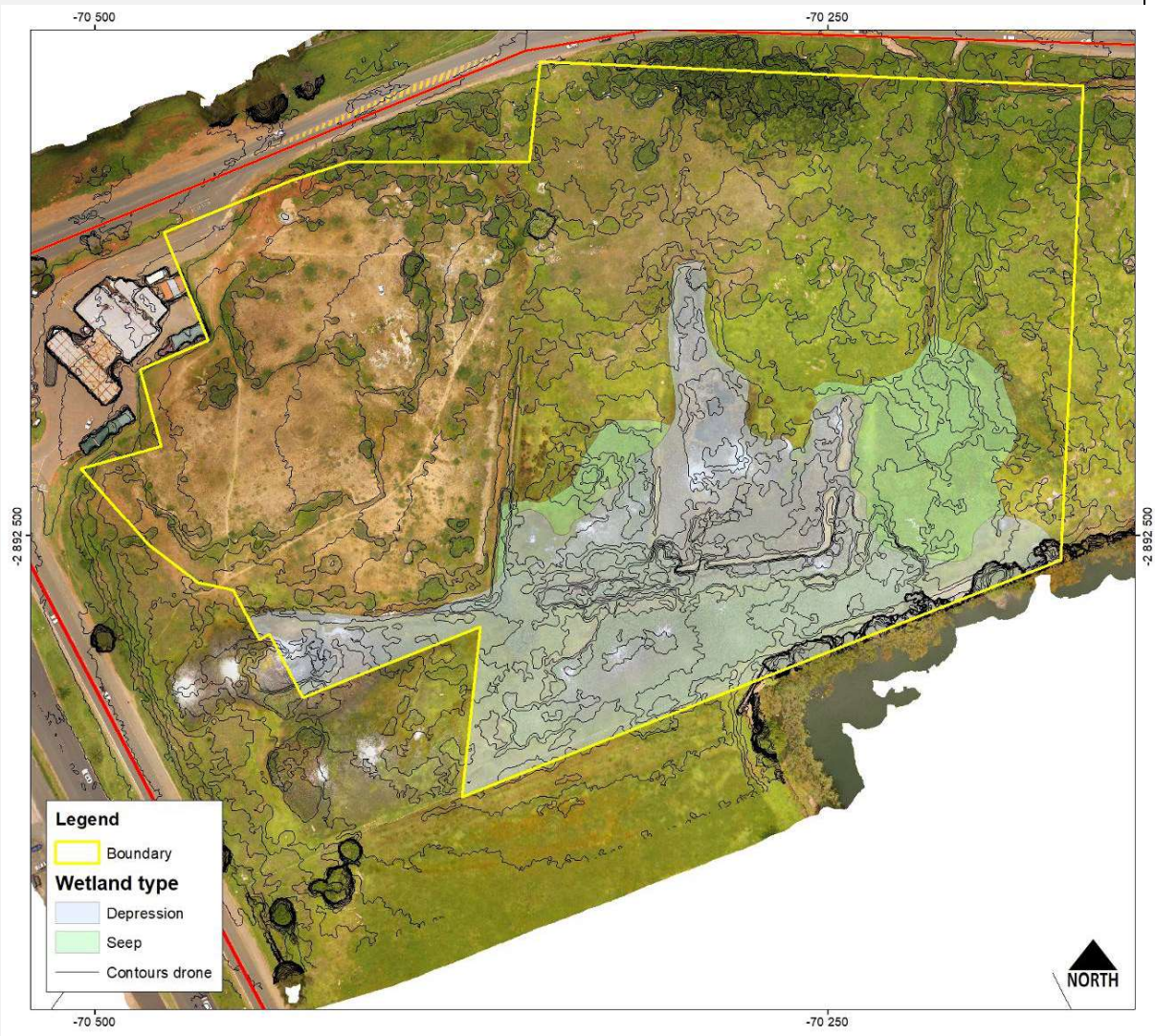


Figure 8: Wetlands on the Development Site

Conclusion & Recommendations

Wetlands are important and ecologically sensitive ecosystems that are protected by law. They are continually under threat from development and agriculture and should therefore be protected as far as realistically possible. Not only do they store and channel water, but they provide a variety of ecosystem services that support terrestrial and water ecosystems. Traditionally wetlands were regarded as cheap land that could easily be developed. Many previous and current developments have not incorporated proper environmental management plans resulting in the release of various pollutants into these systems. As a result, a large number of watercourses in the province are polluted and degraded especially the river systems.

The wetland on the property has been variously affected due to anthropogenic influences as described in this report. The area surrounding the wetland is transformed and comprises weeds and alien invasive species mostly. The permanently wet section of the wetland is the only part of the wetland system that has remained relatively natural although sections are degraded.

The wetland receives a large amount of its water from three stormwater channels that have been artificially dug. The water is received from the residential developments along the northern boundary of the study area.

Due to the infilling the natural topography of the area has been altered permanently. The edge of the wetland is therefore higher than the surrounding terrestrial vegetation area meaning that no surface water flows towards the wetland, but rather into the artificial stormwater channels from where they reach the wetland.

Based on the results of the wetland delineation of this study, the current proposed development plan will have to be adjusted to incorporate the **15m buffer zone and wetland**. Other aspects that are recommended are:

- The services report should address stormwater attenuation through artificial wetlands and swales.
- A landscaping plan should be developed to indicate plant species and wetland management.
- A risk matrix report should be drawn up for the application of the Water use licence.

Buffer Determination

GDARD requires a buffer zone of 30m around wetlands. The end-use objective for a buffer zone is the protection of a core area. Pressey (1997) states that one of the biological benefits of buffer zones is that it enlarges the natural habitat and ecosystem services of a natural area. Barborak (2014) states that it "does not work to legislate a simple boundary (such as 2 km around the exterior of a PAN and also just calling an area a buffer without any efforts to control land use and development, or restore degraded ecosystems".

The negative effect of a degraded ecosystem on a natural area could be equally devastating than development in that system. Garrat (2006) also argues that "a variable buffer zone model offers an effective means of co-managing the relationship between urban and natural areas". Based on the transformed condition of the buffer zone (comprising infilling, rubble, litter and pioneer weedy and alien invasive species) **the 15m buffer zone as determined from the Buffer Tool (DEFF) is recommended on condition that the 15m area is rehabilitated and planted with indigenous species occurring around wetland (see recommendations in this report)**.

It is thought that a rehabilitated 15m buffer zone is more realistic, and it would greatly enhance the total wetland ecosystem and its functioning. A 30m buffer zone would serve no purpose since it would not be feasible to rehabilitate such a large area and topographically it would not serve a function in protecting the wetland system as explained earlier in the report.

Two buffers are indicated on Figure 9 below.

- 30 metres from the wetland edge as recommended by GDARD, and
- 15 metres as calculated by the Buffer Tool of DWS.

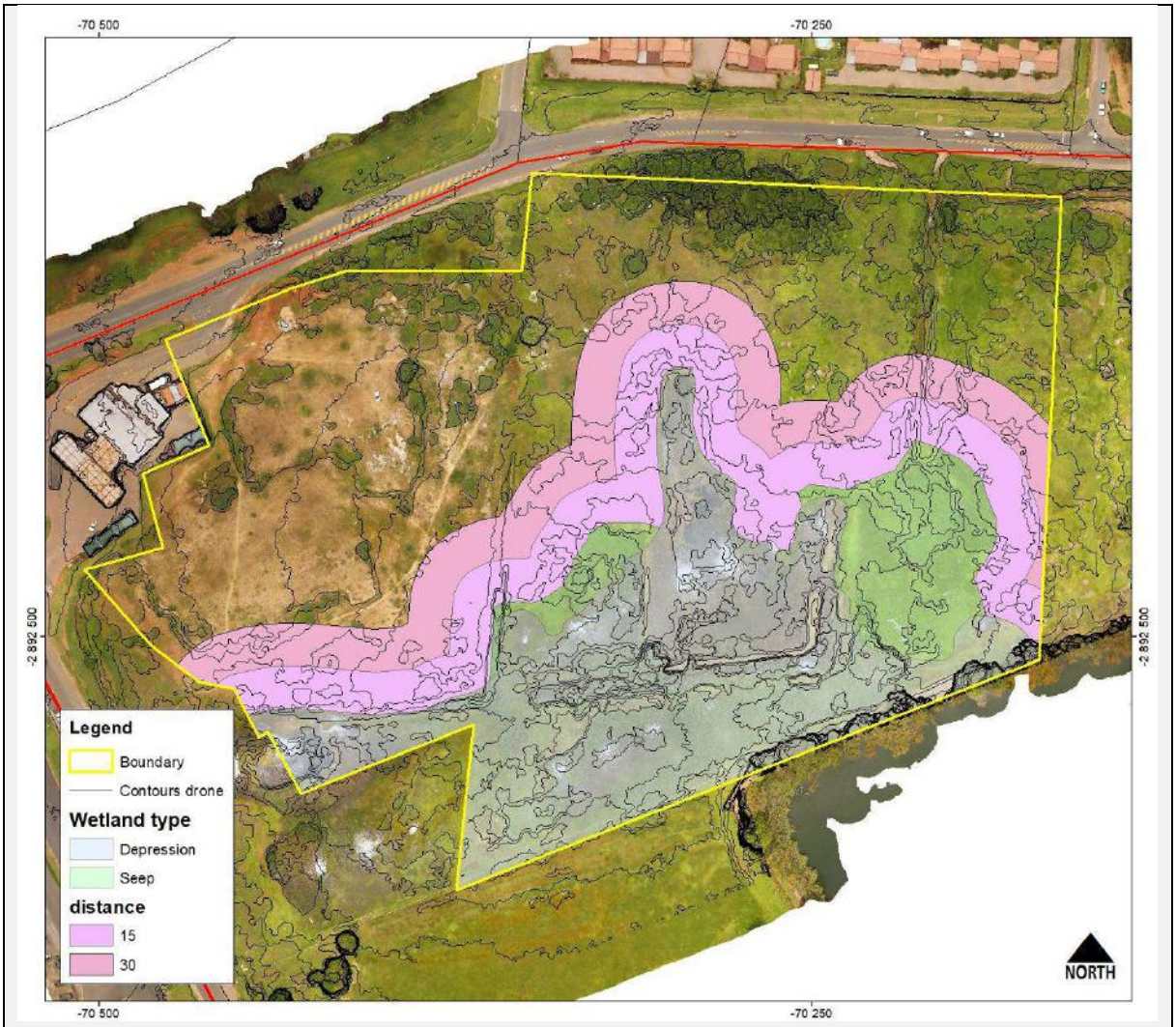


Figure 9: Wetland Buffer

8. LAND USE CHARACTER OF SURROUNDING AREA

Using the associated number of the relevant current land use or prominent feature from the table below, fill in the position of these land-uses in the vacant blocks below which represent a 500m radius around the site.

1. Vacant land	2. River, stream, wetland	3. Nature conservation area	4. Public open space	5. Koppie or ridge
6. Dam or reservoir	7. Agriculture	8. Low density residential	9. Medium to high density residential	10. Informal residential
11. Old age home	12. Retail	13. Offices	14. Commercial & warehousing	15. Light industrial
16. Heavy industrial[AN]	17. Hospitality facility	18. Church	19. Education facilities	20. Sport facilities
21. Golf course/polo fields	22. Airport[N]	23. Train station or shunting yard[N]	24. Railway line[N]	25. Major road (4 lanes or more)[N]
26. Sewage treatment plant[A]	27. Landfill or waste treatment site[A]	28. Historical building	29. Graveyard	30. Archeological site

31. Open cast mine	32. Underground mine	33.Spoil heap or slimes dam[A]	34. Small Holdings	
Other land uses (describe): See below		35. Eskom Substation		

NOTE: Each block represents an area of 250m X 250m, if your proposed development is larger than this please use the appropriate number and orientation of hashed blocks

NORTH

	8/9	**8/9**	**9**	**9**	**8/9**
	8/9	**9**	**9**	**9**	**8/34**
WEST	**34**	**8**	**SITE**	**1**	**34**
	8	**12**	**2**	**2**	**8**
	8/12	**8/12**	**8**	**8**	**8**

EAST

= Site

SOUTH

Note: More than one (1) Land-use may be indicated in a block

Please note: The Department may request specialist input/studies depending on the nature of the land use character of the area and potential impact(s) of the proposed activity/ies. Specialist reports that look at health & air quality and noise impacts may be required for any feature above and in particular those features marked with an "A" and with an "N" respectively.

Have specialist reports been attached	~~YES~~	**NO X**

If yes indicate the type of reports below

n/a

9. SOCIO-ECONOMIC CONTEXT

Describe the existing social and economic characteristics of the area and the community condition as baseline information to assess the potential social, economic and community impacts.

The Metropolitan Spatial Development Framework (MSDF) states six urban planning and management regions. The application site is located within the south-western part of Region C, which is located within the Benoni Customer Care Centre's area of jurisdiction. Region C comprises of the Benoni area to the north of the N12 Highway as well as the Bapsfontein area.

The site is bordered by:

- Celia Nestadt Road to the north,

- Holding 51, Benoni North Agricultural Holdings to the east,
- The future K 86 to the south, and
- Great North Road to the west.

Tthe application site forms part of Brentwood Extension 1 Township that is mainly zoned "Residential 1" and developed accordingly. The Benoni North Agricultural Holdings that is located to the east of the application site is presently being developed at a rapid pace for residential purposes. Diverse combinations of residential densities (single erven, cluster development and flat complexes) are being established in the aforesaid areas.

Furthermore, it needs to be stated that, according to the Area 34 Local Spatial Development Framework, Great North Road is earmarked as an activity spine, and a number of business activities, community facilities, industrial related uses, etc. are being developed adjacent to the aforesaid road. One of these developments adjacent to Great North Road is the Engen Garage that is located directly to the west of the application site.

As indicated above, it is evident that the application site is located centrally in terms of the existing residential area as well as future residential areas, therefore the development (shopping centre) and supporting facilities will form part and will be integrated into the surrounding residential areas.

10. CULTURAL/HISTORICAL FEATURES

Please be advised that if section 38 of the National Heritage Resources Act 25 of 1999 is applicable to your proposal or alternatives, then you are requested to furnish this Department with written comment from the South African Heritage Resource Agency (SAHRA) – Attach comment in appropriate annexure

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site-

(i) exceeding 5 000 m2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Are there any signs of culturally (aesthetic, social, spiritual, environmental) or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including archaeological or palaeontological sites, on or close (within 20m) to the site?	~~YES~~	**NO X**

If YES, explain:

n/a

If uncertain, the Department may request that specialist input be provided to establish whether there is such a feature(s) present on or close to the site.

Briefly explain the findings of the specialist if one was already appointed:

Due to the disturbed nature of the site no archaeological sites/materials were observed during the site investigation. Although it is unlikely that archaeological remains will be found in situ, there is always a possibility that human remains and/or other archaeological and historical material may be uncovered during the development. Should such material be exposed then work must ceased in the immediate area of the finds and it must be reported to SAHRA, so that a systematic and professional investigation can be undertaken.

Will any building or structure older than 60 years be affected in any way?	~~YES~~	**NO X**
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	~~YES~~	**NO X**

If yes, please attached the comments from SAHRA in the appropriate Appendix

SECTION C: PUBLIC PARTICIPATION (SECTION 41)

Note: The Environmental Assessment Practitioner must conduct public participation process in accordance with the requirement of the EIA Regulations, 2014.

1. LOCAL AUTHORITY PARTICIPATION

Local authorities are key interested and affected parties in each application and no decision on any application will be made before the relevant local authority is provided with the opportunity to give input. The planning and the environmental sections of the local authority must be informed of the application at least thirty (30) calendar days before the submission of the application to the competent authority.

Was the draft report submitted to the local authority for comment?	**YES X**	~~NO~~
If yes, has any comments been received from the local authority?	YES	NO

As this is the first announcement of the project and comment opportunity on the Draft Basic Assessment Report, no comments have been received to date. Any comments received from organs of state or any other I&APs on the DBAR will be included in the Final Basic Assessment Report.

If "YES", briefly describe the comment below (also attach any correspondence to and from the local authority to this application):

To be included in the Final Basic Assessment Report

If "NO" briefly explain why no comments have been received or why the report was not submitted if that is the case.

N/A

2. CONSULTATION WITH OTHER STAKEHOLDERS

Any stakeholder that has a direct interest in the activity, site or property, such as servitude holders and service providers, should be informed of the application at least thirty (30) calendar days before the submission of the application and be provided with the opportunity to comment.

Has any comment been received from stakeholders?	YES	NO

As this is the first announcement of the project and comment opportunity on the Draft Basic Assessment Report, no comments have been received to date. Any comments received from organs of state or any other I&APs on the DBAR will be included in the Final Basic Assessment Report.

If "YES", briefly describe the feedback below (also attach copies of any correspondence to and from the stakeholders to this application):

Name of Contact Person	Company / Entity	Date	Question / Comment / Issue Raised
To be included in the Final Basic Assessment Report			

If "NO" briefly explain why no comments have been received

Not Applicable

3. GENERAL PUBLIC PARTICIPATION REQUIREMENTS

The Environmental Assessment Practitioner must ensure that the public participation process is adequate and must determine whether a public meeting or any other additional measure is appropriate or not based on the particular nature of each case. Special attention should be given to the involvement of local community structures such as Ward Committees and ratepayers associations. Please note that public concerns that emerge at a later stage that should have been addressed may cause the competent authority to withdraw any authorisation it may have issued if it becomes apparent that the public participation process was flawed.

The EAP must record all comments and respond to each comment of the public / interested and affected party before the application report is submitted. The comments and responses must be captured in a Comments and Responses Report as prescribed in the regulations and be attached to this application.

Public Participation Information:

3.1 Newspaper Advertisement

Since the proposed development is unlikely to result in any impacts that extend beyond the municipal area where it is located, it was deemed sufficient to advertise in a local newspaper. An advertisement was placed in English in **…** on **…** (*To be included in FBAR*) notifying the public of the Application for Environmental Authorisation and requesting Interested and Affected Parties (I&APs) to register with, and submit their comments to Delron.

3.2 Site Notices

Site notices were placed on site on **…** (*To be included in FBAR*) to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs were given the opportunity to raise comments by … (*To be included in FBAR*). Photographic evidence of the site notices is included in **Appendix E2**.

3.3 Direct Notification of Identified I&APs

Identified I&APs, including key stakeholders representing various sectors, were directly informed of the proposed development. Notification letters (**Appendix E3**) were send on **…** (*To be included in FBAR*). For a complete list of stakeholder details see **Appendix F4**. The consultees included:

- Gauteng Department of Agriculture and Rural Development (GDARD)
- Department of Water Affairs and Sanitation
- City of Ekurhuleni

- The Local Councillor

3.4 Registered I&APs

I&APs include all stakeholders who deem themselves affected by the proposed activity. According to Regulation 43(1) "A registered interested and affected party is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application."

The Draft Basic Assessment Report (DBAR) was made available to all registered I&APs and State Departments for comment opportunity.

3.5 Comments and Response - Issues Raised by IAPs

All issues identified during the review period are documented and compiled into a Comments and Response Report. Refer to **Appendix E6**.

4. APPENDICES FOR PUBLIC PARTICIPATION

All public participation information is to be attached in the appropriate Appendix. The information in this Appendix is to be ordered as detailed below:

Appendix E provides details of the public consultation process.

E PUBLIC PARTICIPATION

E.1 PROOF OF NEWSPAPER ADVERTISEMENTS

E.2 PROOF OF SITE NOTICE

E.3 WRITTEN NOTICES ISSUED

E.4 COMMUNICATIONS TO AND FROM I&APS

E.5 MINUTES OF ANY PUBLIC AND/OR STAKEHOLDER MEETINGS

E.6 COMMENTS AND RESPONSES REPORT

E.7 AUTHORITY CORRESPONDENCE

E.8 COPY OF THE REGISTER OF I&APS

E.9 LIST OF STATE DEPARTMENTS

SECTION D: RESOURCE USE AND PROCESS DETAILS

Note: Section D is to be completed for the proposal and alternative(s) (if necessary)

Instructions for completion of Section D for alternatives

1) For each alternative under investigation, where such alternatives will have different resource and process details (e.g. technology alternative), the entire Section D needs to be completed.
2) Each alterative needs to be clearly indicated in the box below.
3) Attach the above documents in a chronological order.

Section D has been duplicated for alternatives (complete only when appropriate)	**0**	times
Section D Alternative No.	**0**	(complete only when appropriate for above)

1. WASTE, EFFLUENT & EMISSION MANAGEMENT

Solid Waste Management

Will the activity produce solid construction waste during the construction/initiation phase?	**YES X**	~~NO~~
If yes, what estimated quantity will be produced per month?	Quantities are unknown at this stage.	

How will the construction solid waste be disposed of (describe)?

Building rubble and solid construction waste (such as vegetation debris, sand, gravel concrete and spoil material) that cannot be used for filling and rehabilitation and other litter and waste (including packaging, plastics, waste metals, etc.) generated during the construction phase will be placed in a bulk waste collection area in the contractors camp. This waste will disposed at an appropriately registered and licensed waste disposal facility.

Where will the construction solid waste be disposed of (describe)?

All non-recycled general waste will be removed by a registered waste contractor and taken to appropriately registered and licensed waste disposal facility.

Will the activity produce solid waste during its operational phase?	**YES X**	~~NO~~
If yes, what estimated quantity will be produced per month?	Quantities are unknown at this stage.	

The Benoni Customer Care Centre or a registered waste contractor will collect, transport and dispose waste materials. The Benoni Customer Care Centre will provide containers or green refuse bins for wet waste and will be lifted five to seven times a week. In terms of the Health Act, daily refuse removal is compulsory for each business that generates food residue. A compaction vehicle or a rear-end loader will collect and dispose of at licensed landfill site.

How will the solid waste be disposed of (describe)?

All waste will be removed by a registered waste contractor and taken to appropriately registered and licensed waste disposal facility. Hazardous waste will be collected by private contractors and disposed of to landfill. Chain of custody documentation will be retained.

Has the municipality or relevant service provider confirmed that sufficient air space exists for treating/disposing of the solid waste to be generated by this activity?	**N/A**	**N/A**

Where will the solid waste be disposed if it does not feed into a municipal waste stream (describe)?

Waste will feed into the City of Ekurhuleni Metropolitan Municipality's waste stream.

Note: If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation?	~~YES~~	**NO✓**

If yes, inform the competent authority and request a change to an application for scoping and EIA.

Is the activity that is being applied for a solid waste handling or treatment facility?	~~YES~~	**NO✓**

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Describe the measures, if any, that will be taken to ensure the optimal reuse or recycling of materials:

Shopping Centre Management and Tenants to separate waste into glass, tins, paper, hard plastics, organic and general waste. This will be stored in appropriate containers and collected by a contractor on a regular basis, with recyclable waste taken to the nearest appropriate facility, and non-recyclable waste to the municipal landfill site. Organic biodegradables from kitchens will be taken to a composting site.

Liquid Effluent (other than domestic sewage)

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	~~YES~~	**NO X**
If yes, what estimated quantity will be produced per month?		**n/a**
If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the liquid effluent to be generated by this activity(ies)?	**n/a**	**n/a**

Will the activity produce any effluent that will be treated and/or disposed of on site?	~~YES~~	**NO X**
If yes, what estimated quantity will be produced per month?		**n/a**

If yes describe the nature of the effluent and how it will be disposed.
n/a
Note that if effluent is to be treated or disposed on site the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA

Will the activity produce effluent that will be treated and/or disposed of at another facility?	~~YES~~	**NO X**

If yes, provide the particulars of the facility:

Facility name:	**n/a**			
Contact person:	**n/a**			
Postal address:	**n/a**			
Postal code:	**n/a**			
Telephone:	**n/a**	Cell:	**n/a**	
E-mail:	**n/a**	Fax:	**n/a**	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

	Not Applicable

Liquid Effluent (Domestic Sewage)

Will the activity produce domestic effluent that will be disposed of in a municipal sewage system?	**YES X**	~~NO~~
If yes, what estimated quantity will be produced per month?		**Unkown**
If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the domestic effluent to be generated by this activity(ies)?	**YES X**	**N/A**

GLS Consulting Engineers investigated the capacity of the sewer system to serve the proposed business/commercial development. The following summary recommendations were made by GLS Consulting Engineers:

- The proposed development can be incorporated into the area that currently drains to the JP Marais- and Welgedacht WWTPs.
- Although it is not a critical requirement for the proposed development to proceed we strongly recommend that the elimination of the Brentwood Park X1, X23, X27 and the Kirchner Street pump stations be implemented as soon as possible.
- No upgrading to any pump stations or main outfall sewers are required.
- The proposed connection points for both sites are directly onto the existing 160Ø sewer draining through the sites once this sewer has been completed.
- Due to the cadastral layout and the general topography of the area no provision has to be made for any further future developments to drain through the development sites.

Will the activity produce any effluent that will be treated and/or disposed of on site?	~~YES~~	**NO X**

If yes describe how it will be treated and disposed off.

N/A

Emissions into the Atmosphere

Will the activity release emissions into the atmosphere?	~~YES~~	**NO X**
If yes, is it controlled by any legislation of any sphere of government?	n/a	**NO X**
If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.	n/a	n/a
If no, describe the emissions in terms of type and concentration:	n/a	n/a

2. WATER USE

Indicate the source(s) of water that will be used for the activity

Municipal X	~~Directly from water board~~	~~Groundwater~~	~~river, stream, dam or lake~~	~~other~~	~~the activity will not use water~~

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month: n/a

If Yes, please attach proof of assurance of water supply, e.g. yield of borehole, in the appropriate Appendix

Does the activity require a water use permit from the Department of Water Affairs?	**YES X**	~~NO~~

If yes, list the permits required

A Water Use License will be applied for, for impeding and diverting the flow of a water course (Section 21 (c)) and altering the bed, banks, course and characteristics of a watercourse (Section 21(i)) for the construction of the shopping centre and associated infrastructure within the 1:100 year flood line regulated area.

If yes, have you applied for the water use permit(s)?	**YES X**	~~NO~~
If yes, have you received approval(s)? (attached in appropriate appendix)		In Process

3. POWER SUPPLY

Please indicate the source of power supply eg. Municipality / Eskom / Renewable energy source

Electricity is available in the area and the site can connect to the existing network. To be able to develop the site for business purposes the developer needs to apply to the local authority for a connection that can accommodate the proposed development. If any upgrades to the external network are required, it will be for the developers account. This will be dealt with in the Services Agreement. Furthermore it needs to be stated that only one connection will be permitted for the consolidated portion.

If power supply is not available, where will power be sourced from?

Not Applicable

4. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

The following energy savings methods shall be investigated for possible implementation for the proposed development:

- Use of energy efficient lighting,
- Use of day light wherever possible in lieu of artificial lighting,
- Use of renewable solar powered lighting for external lighting,
- Switching off of all electrical appliances at night and times not in use,
- Use of high-efficient HVAC systems,
- Use of solar water heating,
- Setting thermostats of water heaters at the most efficient level,
- Insulation of hot water pipes and hot water storage tanks,
- Use of high-efficient electric motors,
- Use of variable speed drives on electric motors,
- Use of appropriate conductor size to reduce distribution losses,
- Use of control methods to reduce maximum demand and exploit off peak electricity tariffs,
- Insulation of windows, wills, ceilings and roofs.

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

No alternative energy sources have been investigated.

SECTION E: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts as well as the impacts of not implementing the activity (Section 24(4)(b)(i).

1. ISSUES RAISED BY INTERESTED & AFFECTED PARTIES

Summarise the issues raised by interested and affected parties.

- As this is the first announcement of the project and comment opportunity on the Draft Basic Assessment Report, no comments have been received to date. Any comments received from organs of state or any other I&APs on the DBAR will be included in the Final Basic Assessment Report.

Summary of response from the practitioner to the issues raised by the interested and affected parties (including the manner in which the public comments are incorporated or why they were not included)

(A full response must be provided in the Comments and Response Report that must be attached to this report):

Summary: Comments and Response Report

Name of Contact Person	Company / Entity	Question / Comment / Issue Raised	Response

** As this is the first announcement of the project and comment opportunity on the Draft Basic Assessment Report, no comments have been received to date. Any comments received from organs of state or any other I&APs on the DBAR will be included in the Final Basic Assessment Report.*

2. IMPACTS THAT MAY RESULT FROM THE CONSTRUCTION & OPERATIONAL PHASE

Briefly describe the methodology utilised in the rating of significance of impacts.

2.1 METHODS USED TO IDENTIFY POTENTIAL IMPACTS

A combination of the following methods was used to identify impacts during the Basic Assessment:

2.1.1 Specialist Study Findings

1. SPECIALIST TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

Enviridi Environmental Consultants (Pty) Ltd was appointed to conduct a specialist Terrestrial Biodiversity Impact Assessment. A summary is presented here, and the complete report may be found in Appendix G.

Refer to **Appendix G2**.

Impacts expected, Risk and Mitigation

Impacts for the development has been assessed and the risk rating has been determined as Medium or Medium-High (without mitigation) and only based on wetland terrain and other pan features found, however, adhering to mitigation measures, the risk will lower towards Medium-Low or Low.

Impacts assessed include amongst other:

- The site is largely degraded and habitat has been transformed, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The wetland associated areas will especially be negatively impacted if not managed well.
- Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas.
- Impacts on the wetland and water resources located downstream of the transformed wetland system. This may be due to pollutants entering the water resource, specifically petroleum related waste products which could possibly spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones.
- Impacts on the wetland and water resources located downstream during and after closure and demolition. However, since shopping centres do not usually have a closure phase, no impacts are predicted.

Mitigation and management measures are prescribed to ensure the least possible impact on the ecology of the area and should be strictly implemented. These include:

- Stilts and other features could be considered for the shopping centre and this will preserve the remaining functioning of the wetland unit where possible, since the wetland is no longer deemed functional and in good ecological health. However, a wetland delineation and specialist investigation should be conducted by a wetland specialist.
- Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary.

- Adhere to all management and mitigation measures as prescribed within the wetland specialist report.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Continuous rehabilitation of the area should occur, immediate closure and rehabilitation of any areas dug during the construction of the stilts and foundations. This will entail the spreading of topsoil, revegetation and management of invasive species.
- Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment, which should include oil traps.
- Implement an Alien and Invasive Management Programme, which will aim to remove and manage the plants recorded during the field survey, since most of these species are already listed on the Alien and Invasive Species list as published in 2016 (Department of Environmental Affairs, 2016).
- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora.
- If possible, find an alternative placement for features of the shopping centre as to prevent placement within a wetland or wetland soils.
- Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment.
- Continuous rehabilitation of the area should occur in accordance with the WUL or if an offset agreement is devised and approved, as well as monitoring as prescribed.

A formal terrestrial management plan has also been included within Section 10.

Figure 6: Sensitivity delineated according to habitat remaining condition thereof (Including drainage systems and possible wetlands)

It's the reasoned opinion of the specialist that the development may continue if all mitigation measures are implemented and all areas of medium or high sensitivity are avoided where feasibly possible. Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as **Medium sensitivity**. The wetland buffers as delineated and recommended by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance.

2. SPECIALIST WETLAND DELINEATION AND ASSESSMENT

Refer to Appendix G3.

12. Potential Impact of the Proposed Development

Habitat loss

This implies the loss of plant and animal species which ultimately results in a loss of habitat and species diversity.

Description & mitigation

The terrestrial area as well as the identified buffer zone around the wetland area are transformed due to the infill of land with rubble and litter in the past that resulted in the establishment of pioneer weedy and alien invasive plant species. These areas have from a plant ecological and ecosystem functioning a low conservation value. It is therefore not foreseen that development of these areas would have any significant long-term negative effect on the environment. It is however, recommended that areas not to be developed such as the required buffer zone be landscaped and replanted with indigenous vegetation that would naturally occur in and around wetland buffer areas. For these purposes, a list of possible species should be prepared by the landscaper and provided to the ECO for approval. Examples of these include the grasses *Eragrostis curvula, Eragrostis plana, Imperata cylindrica, Cynodon dactylon, Pennisetum macrourum, Agrostis lachnantha, Arundinella nepalensis* and *Diplachne fusca*.

Removal of vegetation (except alien plant species) in the wetland will negatively affect the biota and ecosystem functioning of the wetland system. Wetlands are regarded as sensitive ecosystems with high conservation value due to the variety of ecosystem functions that they provide. Any development within the wetland will have a long-term negative effect on the environment. It is therefore recommended that no development is allowed within the wetland area. The wetland area and applicable buffer zone should be fenced off during development and no person allowed to enter other than for the removal of alien plant species.

Alien vegetation dispersion

Alien vegetation poses a huge risk to the natural environment and its ecosystem functioning. Not only do these plants use a large amount of water causing the drying out of ecosystems, but they also displace the natural vegetation leading to a loss in biodiversity and habitat.

Description & mitigation

A large number of alien vegetation (trees and weeds) are present on the site. If these plants are not properly controlled, the construction and proposed development can cause further spread of these species in the study area and surrounds that would have a long-term negative effect on the wetland system.

In order to prevent the spread of these species and to control them efficiently, it is important that a certified/licensed Pest Control Officer (PCO) is appointed to control the alien invasive plants. Where possible smaller trees, weeds and seedlings should be mechanically removed. Large trees must be cut, and a cut-stump treatment affected. Most herbicides have some toxicity to animals and water organisms. It is therefore important that the herbicides used have as little effect as possible on water organisms and have a short residual effect. The PCO will ensure that correct application is administered to have as little effect on the environment as possible. Weekly reports on the progress as well as herbicides used must be submitted to the Environmental Control Officer (ECO).

Erosion, surface runoff & stormwater

Urban development is characterised by large areas of sealed surfaces such as roads, houses, parking areas, etc. As a result, infiltration is considerably reduced with an increase in surface run-off that is normally channelled toward water courses directly or via storm water pipes that discharge the water into a watercourse. This run-off normally contains pollutants that can negatively affect the ecosystem functioning of the watercourse. Construction activities associated with urban development can also lead to massive, short/medium-term erosion unless adequate measures are implemented to control surface run-off.

Description & mitigation

The proposed development area is mostly flat and levelled with slight indentations due to the previous infilling. The infilling caused the area to slope from the wetland edge away from the wetland towards the northern part of the study site. It is thus unlikely that large erosion problems could be caused during construction. Care must however be taken that construction activities does not result in soil being deposited into the wetland and associated buffer zone since that would result in long-term damage to the wetland. Clearing activities and earth scraping should preferably be restricted to the dry season to prevent erosion It is recommended that sandbags are placed along the fenced-off wetland buffer zone to prevent unnecessary erosion from reaching the wetland and buffer zone. No stockpiling of soil must be done close to the buffer zone.

A stormwater management plan must be developed and approved for the proposed development by the relevant authorities before construction commences. This plan must make provision for trapping pollutants before the water is released into the wetland and also make provision that the force of the water is broken before releasing it into the system. In addition the water should be released at various points so as to prevent large-scale erosion.

Waste pollution

Domestic and industrial waste could severely influence the functioning, water flow and biodiversity of the wetland system.

Description & mitigation

All current waste must be removed from the edge and buffer zone area around the wetland. All waste generated by the construction activities must be removed and disposed of at a licenced waste disposal facility. No temporary waste storage areas may be closer than 30m from the egde of the buffer zone of the wetland. No rubbish pits should be allowed to be dug as well as no burning of waste. A fenced area must be erected where waste can be stored temporarily or for sorting before being disposed of.

A permanent area where waste would be temporarily stored and sorted before being disposed of to a licenced disposal site must be approved and included in the proposed development plan. This area must be at least 30m away from the wetland buffer and developed such that no waste can reach the wetland in any way whatsoever.

In many areas raw sewage is released directly into different watercourses. This is normally a result of bad maintenance and planning before development took place. Raw sewage causes permanent damage to especially a wetland such as this and will destroy the habitat of insects and aquatic organisms. The current planning makes provision for the sewage to be disposed of in an existing main sewer line and it will be outside of the wetland and the buffer zone. A monitoring programme must be developed during and after construction whereby the sewage system is monitored on a daily basis to detect any leakage and to implement the repair of the system within 6 hours after being detected. Contingency plans must also be developed to prevent the sewage from spilling into the wetland.

Buffer Determination

GDARD requires a buffer zone of 30m around wetlands. The end-use objective for a buffer zone is the protection of a core area. Pressey (1997) states that one of the biological benefits of buffer zones is that it enlarges the natural habitat and ecosystem services of a natural area. Barborak (2014) states that it "does not work to legislate a simple boundary (such as 2 km around the exterior of a PAN and also just calling an area a buffer without any efforts to control land use and development, or restore degraded ecosystems".

The negative effect of a degraded ecosystem on a natural area could be equally devastating than development in that system. Garrat (2006) also argues that "a variable buffer zone model offers an effective means of co-managing the relationship between urban and natural areas". Based on the transformed condition of the buffer zone (comprising infilling, rubble, litter and pioneer weedy and alien invasive species) **the 15m buffer zone as determined from the Buffer Tool (DEFF) is recommended on condition that the 15m area is rehabilitated and planted with indigenous species occurring around wetland (see recommendations in this report)**.

It is thought that a rehabilitated 15m buffer zone is more realistic, and it would greatly enhance the total wetland ecosystem and its functioning. A 30m buffer zone would serve no purpose since it would not be feasible to rehabilitate such a large area and topographically it would not serve a function in protecting the wetland system as explained earlier in the report.

Two buffers are indicated on Figure 9 below.

- 30 metres from the wetland edge as recommended by GDARD, and
- 15 metres as calculated by the Buffer Tool of DWS.

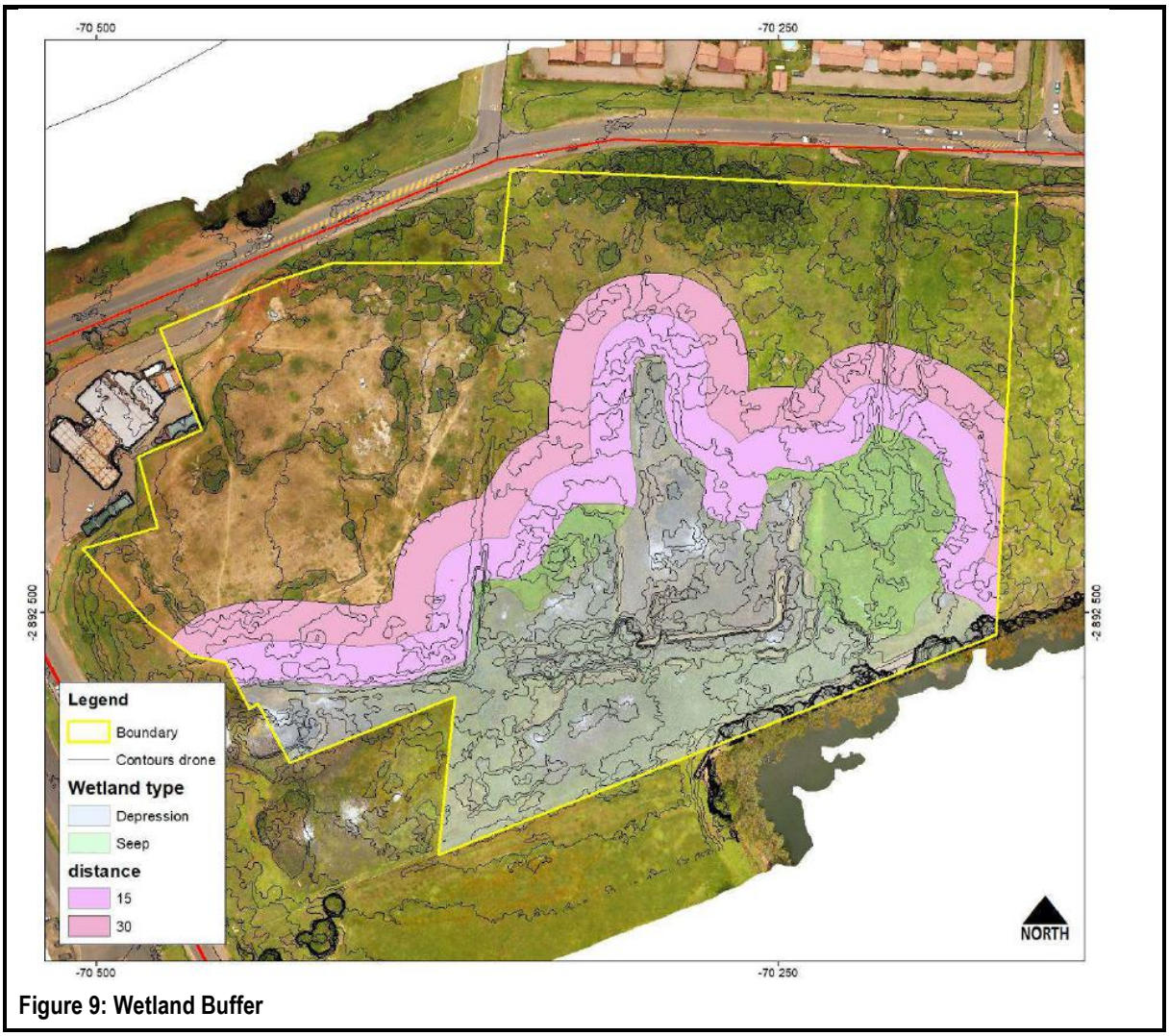


Figure 9: Wetland Buffer

2.1.2 Site Inspection

The EAP and specialist conducted site visits to identify potential sensitive environments. These areas are then red-flagged to be investigated further and excluded from development if necessary.

2.1.3 Technical / Desktop Studies

Technical and specialist reports such as the geotechnical investigation, engineering services report, ecological assessment and wetland report are used to identify those areas and aspects that may be impacted on.

2.1.4 Public Participation

Conducting public participation produces an issues list. Such a list needs to be screened for relevant impacts which then need to be addressed by specialist studies or identified for further investigation.

2.1.5 GDARD Policies, Review / Terms of Reference

GDARD C-Plan 3 as well as the policies provides the red flags that must be investigated by the specialists. Furthermore, the GDARD officials and the different sub-directorates within the department review the application and give comments to the

relevant environmental officer. The issues identified are forwarded to the environmental consultant and these issues are addressed or translated as impacts.

2.1.6 Environmental Aspects

The ISO 14001 international standard on environmental management systems defines 'environmental aspects' as elements of an organisation's activities, products or services that can interact with the environment.

Environmental assessment reports generally include a description of the proposed development for which the assessment is undertaken. The purpose of such a description is to provide the reader with an understanding of what the development involves and thus indicate how the development may interact with the environment. Systematic identification of environmental aspects is the first step to ensure a correct understanding of the development. Only once a development and the way in which it may interact with the environment is correctly understood, can its actual and potential environmental consequences be correctly identified and evaluated.

2.1.6.1 Typical Environmental Aspects Associated With Development

A. Construction Phase

• Construction camp	○ Site offices ○ Accommodation for construction workforce ○ Temporary sanitation facilities ○ Cooking facilities ○ Power supply (electricity / gas / biomass burning / other) ○ Potable water supply for drinking, personal hygiene and cooking ○ Access routes ○ Fencing
• Equipment yards and laydown areas	○ Material and equipment stockpiles ○ Storage and handling of hazardous substances (petrochemicals and other hazardous substances) ○ Vehicle and equipment maintenance workshops ○ Vehicle and equipment wash bays
• Access and hauling routes	○ Scraping / grading ○ Storm water diversion ditches or berms ○ Erosion control ○ Maintenance and repair of damage throughout construction phase ○ Closure and rehabilitation of temporary routes after construction
• Clearance of site to facilitate access and construction	○ Vegetation clearance ○ Demolition of buildings and other obstructions
• Topsoil management	○ Stripping ○ Stockpiling ○ Importation to areas prior to revegetation
• Installation of services	○ Roads ○ Power supply and reticulation ○ Water supply and reticulation ○ Storm water management system

- Waste transfer station / disposal
- Sewage system / sewage treatment
- Telecommunications

- Construction of top structures / houses
  - Excavation for foundations
  - Drilling
  - Blasting
  - Earthworks to establish a level footprint area
  - Importation of fill material
  - Disposal of spoil material
  - Casting of foundations
  - Construction of aboveground structure
  - Construction of fences / boundary walls

- Landscaping
- Stabilisation of slopes and erosion prevention
  - Application of mulch or fabric
  - Stormwater ditches or berms and dissipation structures
  - Engineering solutions (i.e. gabions, gunite, etc.)

- Movement of construction workforce, equipment and materials
- Vehicle and equipment refueling, maintenance, and repairs during breakdowns
- Dust suppression
- Temporary storage and disposal of general waste
- Temporary storage and disposal of waste concrete and other construction rubble
- Temporary storage and disposal of hazardous waste
- Remediation or disposal of soils contaminated with lubricants, fuel or other chemicals

- Concrete batching / mixing
  - Cement silos / store for cement bags
  - Aggregate stockpiles
  - Water supply point
  - Mixing areas
  - Chemicals added to concrete (i.e. retardes)
  - Temporary storage of waste concrete

- Veld and forest fire risk
  - Fires for heating and cooking at construction camp
  - Burning of waste
  - Burning of vegetation

2.2 ASSESSMENT OF IMPACTS

2.2.1 Methodology

Risk assessment involves the calculation of the magnitude of potential consequences (levels of impacts) and the likelihood (levels of probability) of these consequences to occur.

Risk = Consequence + Likelihood; where: (i) likelihood is the probability of occurrence of an impact that affects the environment; and, (ii) consequence is the environmental impact if an event occurs.

Consequence can be calculated as the sum of the risk levels comprising environment type, nature, extent and duration of the potential impact. Likelihood can be calculated as the sum of the risks of frequency and probability of the impact occurring. The likelihood and consequence can input into a matrix in order to identify the significance of the risk occurring. The C + L matrix method therefore combines the scores from the qualitative or semi-quantitative ratings of consequence (levels of impact) and the likelihood (levels of probability) that a specific consequence will occur (not just any consequence) to generate a risk score and risk rating.

Assessment	Definition	Quantification				
		1	2	3	4	5
Environment Type	Type of environment anticipated to be impacted	Degraded sites/ heavy industrial areas/ high density townships	High density residential/ retail and office complexes/ central business districts/ medium industrial/ large- scale agriculture	Medium density residential/ light industrial/ office parks/ sports facilities/ medium- scale agriculture	Low density residential/ small- scale agricultural/ small holdings	Greenfield sites/ nature reserves/ protected areas/ natural recreational facilities
Nature	The potential of the impact to cause harm	Negligible Impact	Minor Impact	Moderate Impact	High Impact	Severe/Irreversible Impact
Extent	The spatial extent or population extent of an impact	Within project area (<500m from project)	Surrounding area (500m – 1km radius)	Outside project area (1 – 5km radius)	Regional and provincial (5 – 50km radius)	National or international (>50km radius)
Duration	The period the impact will interact with the receiving environment	Immediate (days)	Short term (weeks)	Medium term (months)	Long term (years)	Beyond life of project
Frequency	How often the impact will occur	Less than once a year	Annually	Monthly	Weekly	Daily
Probability	The likelihood of the impact occurring	Rare	Unlikely	Possible	Likely	Almost certain

The following significance rating can be derived from the ratings matrix:

Environmental Significance			Description of Rating
	2 – 8	Low Significance	No specific management action required
	9 – 11	Medium-low Significance	Administrative management actions required
	12 – 17	Medium Significance	Management and monitoring action plans required
	18 – 23	Medium-high Significance	Specific management and monitoring plans required
	24 – 30	High Significance	Detailed management and monitoring plans required, potential red flag impact

2.3 ENVIRONMENTAL IMPACTS IDENTIFIED AND RECOMMEND MITIGATION MEASURES

The following section of the report identifies direct impacts associated with the construction & operational phases of the development.

Note: Feasible alternatives (i.e. location, activity and property alternatives) do not exist for the proposed project as this is the only land parcel that the applicant was able to acquire, and it would not be economically feasible for the business to find and or purchase new property. The proposed area of development has been informed and recommended by the geotechnical and terrestrial ecological assessments conducted as part of this Basic Assessment. The initial proposed footprint was reduced, and the layout was revised as a measure to avoid areas of high sensitivity. It would not be economically feasible or practical for the applicant to embark on a different activity on the site. The No-Go alternative will be considered.

2.3.1 CONSTRUCTION PHASE AND OPERATIONAL PHASE

Impact 1: Vegetation Clearing

Most of the natural occurring indigenous vegetation within the proposed development footprint will be permanently lost due to development. The site is largely degraded and habitat has been transformed, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat.

The wetland associated areas will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the compromised area.

Mitigation

- The wetland must be protected by means of a 15 meter conservation buffer where no development is allowed as recommended in the wetland specialist report.

- Stilts and other features could be considered for the shopping centre and this will preserve the remaining functioning of the wetland unit where possible, since the wetland is no longer deemed functional and in good ecological health.
- Development planning must ensure loss of vegetation and disturbance is restricted to within the recommended development layout footprint.
- The construction area should be clearly demarcated and no activity or disturbance to vegetation must be permitted outside of the demarcated site area.
- Open space areas allocated within the site must be adequately maintained to allow for continuance of ecological functionality and persistence of biodiversity.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Only indigenous vegetation is to be planted in site rehabilitation and in landscaping activities within the development.
- Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment.
- Alien invasive species identified on site should be removed (prioritising category 1 species) prior to construction.
- Regular cleaning up of the wetland areas should be undertaken to remove litter.

Potential impact predicted during construction/operation

Aspect	**No Mitigation**	**With Mitigation**
Environment Type	Degraded sites (1)	Degraded sites (1)
Nature	Moderate impact (3)	Low Impact (2)
Extent	Within project area (<500m from project) (1)	Within project area (<500m from project) (1)
Duration	Long term (4)	Short term (2)
Frequency	Monthly (3)	Monthly (3)
Probability	Almost certain (5)	Unlikely (2)
CONSEQUENCE	9	6
LIKELIHOOD	8	5
Significance Rating (SR)	Medium Significance (17)	Medium-Low Significance (11)

Impact 2: Introduction and Increase in Alien Vegetation

Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas.

Mitigation

- Alien invasive species identified on site should be removed (prioritising category 1 species) prior to construction.
- Manual or mechanical removal should be done as opposed to chemical removal.
- Implement an Alien and Invasive Management Programme, which will aim to remove and manage the plants recorded during the field survey, since most of these species are already listed on the Alien and Invasive Species list as published in 2016 (Department of Environmental Affairs, 2016).
- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.

Potential impact predicted during construction/operation

Aspect	**No Mitigation**	**With Mitigation**
Environment Type	Degraded sites (1)	Degraded sites (1)
Nature	Moderate impact (3)	Negligible Impact (2)
Extent	Within project area (<500m from project) (1)	Within project area (<500m from project) (1)
Duration	Long term (4)	Medium term (3)
Frequency	Monthly (3)	Monthly (3)
Probability	Possible (3)	Unlikely (2)
CONSEQUENCE	9	6
LIKELIHOOD	6	5
Significance Rating (SR)	Medium Significance (15)	Medium-Low Significance (11)

Impact 3: Impacts on the Wetland, Soil and Water Resources

Impacts on the wetland and water resources located downstream of the transformed wetland system. Potential soil and water contamination as a result of construction activities.

Spillage of contaminants (such as cement-mix, oil, lubricants and fuel) from vehicles and construction activities (such as cement mixing, plant and vehicles maintenance, and other machinery) during construction could potentially impact on soils and groundwater.

Erosion - Clearing of the site will expose soil surfaces, which may increase the risk of soil erosion during the construction phase. Uncontrolled storm water runoff may further exacerbate the risk of erosion.

Wetland Mitigation

- Ensure that no construction is planned within the sensitive environment (wetland and 15 meter conservation buffer). The wetland and associated buffer will be demarcated as no-go areas.
- Adhere to all management and mitigation measures as prescribed within the wetland specialist report.
- No excavation or construction shall be permitted within the 1:100 year flood line or wetland delineation (whichever is the greatest) without prior approval from the Competent Authority (DWS or Catchment Management Agency) in the form of a water use authorisation.
- Include environmental awareness aspects into the site induction program to ensure all staff are aware of the location and importance of wetland habitats on site.
- Regular cleaning up of the wetland areas must be undertaken to remove litter.
- Establish emergency response measures and a clearly defined chain of communication to rapidly deal with any unforeseen impacts to wetland, e.g. spills.
- Ensure proper stormwater management and maintenance of this system. Stormwater management will prevent impacts reaching the natural environment.

Soil Mitigation

- All items related to construction including site camp and stockpiles are to be kept within the confines of the property.
- During construction phase, all soil stockpiles must be located on level areas, which are not susceptible to erosion and at a suitable distance from drainage areas.
- Soil stockpiles must not exceed 1.5 m in height and should not be stored for longer than 6 months. If alien material sprouts in stockpiles, this must be removed immediately.
- All construction equipment must be in good working order, especially with respect to leaks of oil, fuel or hydraulic fuels.
- Any contaminated soil must be removed from the construction area and disposed of at registered waste disposal sites.
- During construction appropriate waste control, recycling and waste removal systems must be installed to prevent pollution of the soil.
- A defined parking area must be demarcated for vehicles and vehicle movement should be restricted to the minimum necessary for the construction activities. Re-fueling of vehicles must be restricted to the site camp and must only be done on impervious surfaces.
- Drip-trays must be provided beneath standing vehicles and machinery, and routine checks should be done to ensure that these are in a good condition.
- Mixing of cement must be done on impervious surfaces only.
- All vehicle activity must be confined to the existing access tracks.

Surface & Groundwater

- The Contractor must ensure that no contaminated surface water flows off-site as a result of Contractor operations. Silt traps must be constructed to ensure retention of silt on site and cut-off ditches shall be constructed to ensure no runoff from the site except at points where slit traps are provided.
- No rock, silt, cement, grout, asphalt, petroleum product, timber, vegetation, domestic waste, or any deleterious substance should be placed or allowed to disperse into any drainage line.
- Ensure all construction equipment is free of leaks from oil, fuel or hydraulic fuels. No construction vehicles should be cleaned on site. Re-fueling of vehicles must only occur within the confines of the site camp on an impervious surface.
- Mixing of cement must only be done on impervious surfaces.
- Concrete mixing areas must be fitted with a containment facility for the collection of cement laden water. This facility must be impervious to prevent soil and groundwater contamination.
- Runoff from the cement/ concrete batching areas shall be strictly controlled, and contaminated water shall be collected, stored and either treated or disposed of off-site.
- No building material and/or remnants of cement must be left on site.
- Chemical toilets must be made available to construction staff.

Erosion

- The extent of the disturbance will influence the risk and consequences of erosion at the site. It is advisable to undertake construction in a phased manner, so as to limit the size of the area to be exposed at any one time. The minimum amount of vegetation should be removed from the individual construction sites.
- Until re-vegetation is successful, temporary stabilization measures must be used to prevent erosion. These can include the use of gravel bags, straw and other matting materials, hay bales, siltation fences, sedimentation basins, grassy swales, hydro-seeding, and straw mulching.
- Construction activities and vehicles should not be allowed outside the fenced/demarcated area indicated for construction.

Potential impact predicted during construction/operation

Aspect	**No Mitigation**	**With Mitigation**
Environment Type	Degraded sites (1)	Degraded sites (1)
Nature	Moderate impact (3)	Low Impact (2)
Extent	Outside project area (1 – 5km radius) (3)	Within project area (<500m from project) (1)
Duration	Long term (4)	Medium term (3)
Frequency	Monthly (3)	Monthly (3)
Probability	Almost certain (5)	Unlikely (2)
CONSEQUENCE	11	6

LIKELIHOOD	8	5
Significance Rating (SR)	Medium – High Significance (19)	Medium Significance (11)

Impact 4: Stormwater Discharge / Waste Pollution

Storm water discharge points may result in potential disturbance and negative impact upon wetland zones and wetland vegetation.

Stormwater and downstream surface watercourses could be contaminated as a result of minor spillages of hydrocarbons (oils, diesel, etc.) or leakage of such substances from construction machinery that enter watercourses through surface runoff during rainfall events or subsurface movement (through groundwater) and then migrate to downstream systems.

- The wetland areas must be protected by means of a 15 meter conservation buffer where no development is allowed.
- Construction camps, storage areas, soil stockpile areas and laydown areas must be located above the new 1:100 year flood line and/or the 15 meter buffer line, whichever is the greatest distance.
- Design and implement a storm water management plan that aims to minimise the concentration of flow and increase in flow velocity, as well as minimising sediment transport off site.
- Efficient drainage must be provided on site prior to construction.
- Site drainage must prevent ponding near structures and roads, and ensure that uncontrolled surface run-off does not encourage unwanted surface erosion and scour. Recommendations contained within the engineer's report with regards to stormwater control and erosion prevention must be implemented throughout the lifespan of the project.
- Initiate replanting of disturbed areas immediately after construction is completed to minimise any excess runoff.
- Managed storm water discharge points that have energy dissipating measures implemented at each point.
- Spillages should be cleaned up immediately and contaminants properly drained and disposed of using appropriate waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the construction site must be removed and disposed of appropriately.
- Any cement batching activities should occur in the construction camp and conducted on an impermeable surface. Cement products/ wash may not be disposed of into the natural environment.

Stormwater Management Conditions for Discharge into a Stream - Discharge of stormwater into a wetland shall be subject to at least the following conditions:

- The discharge water shall be routed through an energy dissipating structure or stilling basin such that the velocity of the discharge water is reduced to a value between 0,8 m/s and 1,0 m/s (or less) depending on the soil conditions at the point of discharge; it is up to the designer to substantiate the design parameters by submitting soil test results;
- The energy dissipating structure shall be constructed in such a way that it will accommodate flow conditions in the stream, depending on the level of discharge;
- The outlet structure shall be provided with an appropriate upstream apron dipped against the direction of flow as well as a key on the downstream side;
- The energy dissipating elements shall be positioned such that the anticipated flow for a 1 in 25 year event in the stream is not interfered with;
- Texturing of the outlet structure elements that extend beyond the 1 in 25 year event is to be provided such that nearest compatibility with the natural watercourse is achieved;

- The angle of discharge will not be greater than 30º relative to the average direction of flow established over a distance of 20 m upstream of the point of discharge;
- The resultant gradient between the point of discharge in the direction of flow and that of the bed of the stream shall such that it complies with the velocity restriction stated above;
- Segmented material used in the outlet structure shall be adequately anchored;
- Existing vegetation shall be reinstated where disturbed during construction;
- Install silt and litter traps as part of the Stormwater Management System, where required. The silt and litter traps must be monitored and well maintained (i.e. regularly cleaned etc.). Maintenance requirements should be included in the Stormwater Management Plan. Erosion and sedimentation into water bodies must be minimised through effective stabilisation (such as silt traps, gabions and Reno mattresses) and re-vegetation of any disturbed areas.

Potential impact predicted during construction/operation

Aspect	**No Mitigation**	**With Mitigation**
Environment Type	Degraded sites (1)	Degraded sites (1)
Nature	Moderate impact (3)	Low Impact (2)
Extent	Outside project area (1 – 5km radius) (3)	Within project area (<500m from project) (1)
Duration	Long term (4)	Medium term (3)
Frequency	Monthly (3)	Monthly (3)
Probability	Almost certain (5)	Unlikely (2)
CONSEQUENCE	11	6
LIKELIHOOD	8	5
Significance Rating (SR)	Medium – High Significance (19)	Medium Significance (11)

Impacts that may result from the No- Go Alternative

The No Go Alternative means "the option of not implementing the activity", or maintaining the status quo at the site. Should this option be considered the following would be applicable:

Negative impacts associated with the No Go Alternative include:

- The proposed project objectives will not materialise; which implies a significant loss of opportunity for the development of the site and creation of a convent shopping environment for the community.
- No additional capital investment would result. If not developed, the site will derive no income and will not contribute to the services and total income of the area.
- There would be no temporary or permanent employment opportunities created, with the associated economic and social upliftment and skills transfer, during the construction and operational phases of the development.
- Invasive vegetation would probably continue to spread in areas where land is vacant and not actively used in its entirety.
- Illegal squatters are becoming increasingly interested in using this site and are posing more of a threat to local inhabitants. They are setting up temporary structures on unsupervised areas of the site that are well hidden. If this continues unchecked, it may spread and the land may become unmanageable.

Positive impacts associated with the No Go Alternative include:

- Cumulative negative impacts associated with development would not occur. These include potential biophysical impacts; land use and construction-related activities.

However, no significant benefits associated with the No Go Alternative have been identified, which would support the site remaining undeveloped. No environmental risk factors were determined which should prevent the proposed development of the shopping centre from taking place. The No Go Alternative is thus not the preferred alternative for this application.

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

- Enviridi Environmental Consultants (Pty) Ltd, Terrestrial Biodiversity Impact Assessment, 2020. **Appendix G1**
- Dr Andries Gouws & Prof Leslie Brown, Specialist wetland delineation and Assessment, 2020. **Appendix G2**.

Describe any gaps in knowledge or assumptions made in the assessment of the environment and the impacts associated with the proposed development.

- **Assumptions**

In undertaking this BAR, it has been assumed that:

- All requirements from the local authority will be met by the proponent as a separate undertaking to the EIA process;
- The information provided by the proponent and the project planning team / specialists is accurate and discloses all information relevant to EIA, proposed project and possible impacts.
- Where supporting or baseline information was unavailable, a precautionary approach is adopted.
- It is assumed that all mitigation, management and monitoring measures prescribed in this Basic Assessment Report, Specialist and Technical Reports and the accompanying Environmental Management Plan will be implemented.

- **Gaps in Knowledge**

All technical and specialist studies are conducted to certain levels of confidence, but in all instances known methodologies have been used and confidence levels are generally high. This means that in most cases the situation described in the pre-

construction environment is accurate at high certainty levels, but there exists a low probability that some issues have not been identified during the studies. Furthermore, statistical analyses and mathematical models are merely tools which assist the researcher in assessing field observations and have innate assumptions which can reduce objectivity of the results obtained. This is not seen as a major flaw but should always be considered when assessing results.

Gaps in knowledge known to Delron at this time, includes:

- Predicting the impact to the socio-economic and bio-physical environment for the life-cycle of the proposed project (i.e. 25-50 years).

3. IMPACTS THAT MAY RESULT FROM THE DECOMMISSIONING AND CLOSURE PHASE

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the decommissioning and closure phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Since no decommissioning phase is envisaged, the impacts of such a phase is not assessed in this Basic Assessment Report. Should certain of the project components be decommissioned in future, the environmental and other relevant legislation applicable to those activities at that time will need to be complied with.

The decommissioning phase will have similar Low to Medium impacts as associated with the construction phase.

Impacts on the wetland and water resources located downstream during and after closure and demolition.

The results may be positive, if invaders have been brought under control during the construction and operational phase of the project, the site may be rehabilitated back to a natural landscape. However, since shopping centres do not usually have a closure phase, no impacts are predicted.

Mitigation: If closure does occur:

- Establish emergency response measures and a clearly defined chain of communication to rapidly deal with any unforeseen impacts to wetland, e.g. spills.
- The Contractor must ensure that no contaminated surface water flows off-site as a result of Contractor operations. Silt traps must be constructed to ensure retention of silt on site and cut-off ditches shall be constructed to ensure no runoff from the site except at points where slit traps are provided.
- No rock, silt, cement, grout, asphalt, petroleum product, timber, vegetation, domestic waste, or any deleterious substance should be placed or allowed to disperse into any drainage line.
- Adhere to all management and mitigation measures as prescribed within the wetland specialist report and Environmental Management Programme.
- Prevent impacts from reaching downstream water resources by ensuring no spillage and proper handling of infrastructure during removal.
- Continuous rehabilitation of the area should occur in accordance with the WUL (specifically to the wetlands and pans), as well as monitoring as prescribed.
- Annual monitoring of the vegetation and habitat types should be instigated until it is sure that the areas have naturally regrown and vegetation is self-sustainable. If the regrowth is unsuccessful, it will be the applicant's responsibility to restore damaged and degraded habitat areas until it reached sustainability.

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

- Enviridi Environmental Consultants (Pty) Ltd, Terrestrial Biodiversity Impact Assessment, 2020. **Appendix G1**
- Dr Andries Gouws & Prof Leslie Brown, Specialist wetland delineation and Assessment, 2020. **Appendix G2**.

Where applicable indicate the detailed financial provisions for rehabilitation, closure and ongoing post decommissioning management for the negative environmental impacts.

Not Applicable

4. CUMULATIVE IMPACTS

Describe potential impacts that, on their own may not be significant, but is significant when added to the impact of other activities or existing impacts in the environment. Substantiate response:

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. This section provides a description and analysis of the potential cumulative effects of the development and considers the effects of any such changes on the biophysical environment and the socio-economic conditions.

Cumulative Impacts Analysis

For the most part, cumulative impacts or aspects thereof are too uncertain to be quantifiable, due to mainly lack of data availability and accuracy. This is particularly true of cumulative impacts arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

Given the limited detail available regarding such future developments, the analysis that follows is of a generic nature and focuses on key issues and sensitivities for the proposed activity and how these might be influenced by cumulative impacts with other activities. In most cases, only qualitative assessments of cumulative impacts are possible, i.e. they are not formally rated.

Cumulative Impacts

Incremental losses and fragmentation of habitat are two of the more serious cumulative impacts in terms of fauna and flora. Given the largely transformed and degraded nature of the surrounding landscape, the characteristics and sensitivity of the affected area, the nature of the proposed development, and the potential for cumulative impacts are expected to be low as the activities and therefor the impacts will increase.

It was not realistically possible or very difficult to perform an impact assessment for the cumulative impacts based on the available information. The most important aspect related to cumulative impact management for the shopping centre, will be to prevent contamination of the surrounding environment.

In summary, potential cumulative impacts created from the establishment of the shopping centre will be reduced should mitigation measures be implemented.

5. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that sums up the impact that the proposal and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Proposal

A review of the information contained herein shows that the proposed development does not have a significantly detrimental impact on the environment. There is no fatal flaw associated with this development, especially when making use of the mitigation measures proposed.

The preferred development alternative, with recommended mitigation measures in place, is associated with the following impacts:

CONSTRUCTION / SITE DEVELOPMENT PHASE / OPERATIONAL PHASE			
Type of Impact	**Duration**	**Likelihood of Impact Occurring**	**Significance after mitigation**
Impact 1: Vegetation Clearing Most of the natural occurring indigenous vegetation within the proposed development footprint will be permanently lost due to development. The site is largely degraded and habitat has been transformed, however, the onset of additional construction activities might result in impacts to the natural environment.	Short	Unlikely	**Medium-Low (-)**
Impact 2: Introduction and Increase in Alien Vegetation Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas.	Medium	Unlikely	**Medium-Low (-)**
Impact 3: Impacts on the Wetland, Soil and Water Resources Impacts on the wetland and water resources located downstream of the transformed wetland system. Potential soil and water contamination as a result of construction activities. Spillage of contaminants (such as cement-mix, oil, lubricants and fuel) from vehicles and construction activities (such as cement mixing, plant and vehicles maintenance, and other machinery) during construction could potentially impact on soils and groundwater. Erosion - Clearing of the site will expose soil surfaces, which may increase the risk of soil erosion during the construction phase. Uncontrolled storm water runoff may further exacerbate the risk of erosion.	Medium	Unlikely	**Medium (-)**
Impact 4: Stormwater Storm water discharge points may result in potential disturbance and negative impact upon wetland zones and wetland vegetation. Stormwater and downstream surface watercourses could be contaminated as a result of minor spillages of hydrocarbons (oils, diesel, etc.) or leakage of such substances from construction machinery that enter watercourses through surface runoff during rainfall events or subsurface movement (through groundwater) and then migrate to downstream systems.	Medium	Unlikely	**Medium (-)**
Income and Employment - The development of the site will provide income and job opportunities during the construction and operational phases.	Long	Definite	**Benefit**
Cultural and Historical Impacts - Not applicable, there are no cultural- historical sensitive receptors near the site.	-	-	**-**

The Environmental Management Programme (Appendix H) supporting this BA outlines adequate methods and mitigation measures that need to be implemented in order for the identified impacts to not pose any environmental flaws associated with the proposed development and associated infrastructure.

Alternative 1:

Not Applicable

Alternative 2

Not Applicable

No-go (compulsory)

The No-go alternative would result in the maintenance of the status quo and leave the land vacant with no economic or social benefit in return. Previous land uses left the site in a derelict and disturbed state. The implications of this alternative have been assessed to range from **No Impacts** (biophysical impacts; land use and construction-related activities) to **Negative** current impacts, including:

- High levels of habitat degradation and transformation due to present and historic activities on site.
- Invasive vegetation would probably continue to spread in areas where land is vacant and not actively used in its entirety.
- No clearance of present alien species.
- No upliftment of previously disadvantaged individuals via employment opportunities in both phases of the development.
- No contribution would occur to the local economy via the payment of rates and taxes.

Positive impacts associated with the No Go Alternative include:

- Cumulative negative impacts associated with development would not occur. These include potential biophysical impacts, land use and construction-related activities.

However, no significant benefits associated with the No Go Alternative have been identified, which would support the site remaining undeveloped.

No environmental risk factors were determined which should prevent the proposed development of the shopping centre from taking place. The No Go Alternative is thus not the preferred alternative for this application.

6. IMPACT SUMMARY OF THE PROPOSAL OR PREFERRED ALTERNATIVE

For proposal:

The Development Proposal

The development proposal, including the best practice design and layout alternatives, has been found to have the following associated impacts:

- The site is largely degraded and habitat has been transformed, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The wetland associated areas will especially be negatively impacted if not managed well.
- Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas.
- Impacts on the wetland and water resources located downstream of the transformed wetland system. This may be due to pollutants entering the water resource.
- Impacts on the wetland and water resources located downstream during and after closure and demolition. However, since shopping centres do not usually have a closure phase, no impacts are predicted.

Impacts for the development has been assessed and the risk rating has been determined as **Medium** or **Medium-High** (without mitigation) and only based on wetland terrain and other pan features found, however, adhering to mitigation measures, the risk will lower towards **Medium-Low** or **Low**.

None of these associated impacts has been found to be of an unacceptable level; all of these impacts can be avoided or minimised provided that the mitigation measures recommended in the EMP are followed.

Benefits which have been identified associated with operating the site is job opportunities and income for staff; an income stream for the applicant as well as income contribution to the local economy. Biophysical benefits are rehabilitation of a degraded wetland and eradication of present alien species.

The No Go Alternative:

- The No Go Alternative entails maintaining the status quo at the site, which is an undeveloped degraded "Business and Residential" zoned property. There are no specific benefits to maintaining the site as it is, although none of the negative impacts associated with the proposed shopping centre development would occur if the site is not developed.

The development footprint of the proposed shopping centre development is not considered to be highly environmentally sensitive and the proposed development will therefore not adversely affect environmental processes provided the relevant Environmental Management Programme is implemented throughout the construction phase. The significance of impacts during the construction and operation phases are summarised below:

PLANNING, DESIGN, CONSTRUCTION & OPERATIONAL PHASE			
Environmental Impact	**No-go Alternative**	**Preferred Alternative: Impact Significance without Mitigation Measures**	**Preferred Alternative: Impact Significance with Mitigation Measures**
Impact 1: Vegetation Clearing	None - Neutral	Medium Significance	Medium-Low Significance
Impact 2: Introduction and Increase in Alien Vegetation	None - Neutral	Medium Significance	Medium-Low Significance
Impact 3: Impacts on the Wetland, Soil and Water Resources	None - Neutral	Medium – High Significance	Medium Significance
Impact 4: Stormwater Discharge	None - Neutral	Medium – High Significance	Medium Significance
Income and Employment	None - Neutral	-	Benefit

For alternative:

Not Applicable

Having assessed the significance of impacts of the proposal and alternative(s), please provide an overall summary and reasons for selecting the proposal or preferred alternative.

A. SUMMARY OF THE PROPOSED DEVELOPMENT

The subject site comprises of a Portion of Erf 440 and Erf 488, Brentwood Extension 1, which as a whole is approximately 5 ha in extent. It is proposed to consolidate the two erven in order to enable the single shopping centre development. It has become the intention of the developer to develop a reduced shopping centre with a maximum extent of about 9,500 m² GLA. The proposed shopping centre will be the size of a typical neighbourhood centre.

Refer to the Layout Plan attached as **Appendix C**.

Activities that will occur on site will include phased vegetation clearance, construction of new access point and access road, internal roads, installation of services, fencing around the site and construction of top structures and landscaping.

A Water Use License will be applied for, for impeding and diverting the flow of a water course (Section 21 (c)) and altering the bed, banks, course and characteristics of a watercourse (Section 21(i)) for the construction of the shopping centre and associated infrastructure within the 1:100 year flood line regulated area.

B. ALTERNATIVES

The preferred site for the proposed shopping centre development is located at co-ordinates 26° 8'21.41"S and 28°17'46.28"E, on Erven 440 and 488 of Brentwood Extension 1. According to the Ekurhuleni Town Planning Scheme, 2014 Erf 488, Brentwood Extension 1 is zoned "Business 2" and Erf 440, Brentwood Extension 1 is zoned "Residential 3".

No site alternatives were assessed for the proposed project. The currently selected site is the only site available to the applicant and the need for and desirability of the proposed development have been demonstrated.

The preferred layout for the proposed development has been informed by a range of practical, technical and environmental considerations. These considerations have resulted in the preferred layout as presented in the Basic Assessment Report.

The following factors were taken in consideration:

- **Flood Lines**

A watercourse (natural pan) is located on the eastern portion and a 1:100 year flood line is applicable. The 1:100 year flood line will be taken into consideration in the proposed development and no development will take place within the aforesaid flood line area without a water use license or the necessary authorisation.

- **Stormwater Attenuation**

It is a requirement for the Ekurhuleni Metropolitan Municipality that stormwater runoff from the site must be retained in such a way that the runoff before development for a 5-year or a 25-year storm be retained after development to restrict the flows to values before development. In the calculations, it was determined that 1100.92 m³ needs to be attenuated on site.

- **Wetland**

The wetland on the property has been variously affected due to anthropogenic influences as described in this specialist report. The area surrounding the wetland is transformed and comprises weeds and alien invasive species mostly. The permanently wet section of the wetland is the only part of the wetland system that has remained relatively natural although sections are degraded. The wetland receives a large amount of its water from three stormwater channels that have been artificially dug. The water is received from the residential developments along the northern boundary of the study area.

Due to the infilling the natural topography of the area has been altered permanently. The edge of the wetland is therefore higher than the surrounding terrestrial vegetation area meaning that no surface water flows towards the wetland, but rather into the artificial stormwater channels from where they reach the wetland.

GDARD requires a buffer zone of 30m around wetlands. Based on the transformed condition of the buffer zone (comprising infilling, rubble, litter and pioneer weedy and alien invasive species) the 15m buffer zone as determined from the Buffer Tool (DEFF) is recommended on condition that the 15m area is rehabilitated and planted with indigenous species occurring around wetland (see recommendations in this report). It is thought that a rehabilitated 15m buffer zone is more realistic, and it would greatly enhance the total wetland ecosystem and its functioning. A 30m buffer zone would serve no purpose since it would not

be feasible to rehabilitate such a large area and topographically it would not serve a function in protecting the wetland system as explained earlier in the report.

Cognisance was also taken of the physical characteristics, legal encumbrances and future master planning of the Municipality for the area during the design and layout phase of the project. All existing and future servitudes and other encumbrances have been accommodated in the proposed layout.

C. SOCIO-ECONOMIC

- The sites are earmarked for "Business 2" and "Residential" uses in terms of the Ekurhuleni Town Planning Scheme, 2014.
- According to the Area 34 LSDF, the application site forms part of a mix used corridor zone of which the following land uses are permitted on the application:
- Residential buildings, Residential establishment, Community orientated uses, Home undertakings and professional home office, Place of instruction, Place of public worship, Place of refreshments, Institutions, Business buildings, Medical orientated uses and Retail..
- The application site is strategically located within a highly accessible area, surrounded by residential areas.
- Easy access to services (water, sewage, electricity, roads, storm water, waste removal).
- The construction and operation of the site will provide income and job opportunities. With regards to job creation, it is estimated that more than 150 new job opportunities will be created once the shopping centre are fully developed.

D. BIO-PHYSICAL ENVIRONMENT

- **Soil and Geology**

A Geotechnical Investigation was undertaken by Soilkraft cc. and the report is attached hereto as Appendix G1. The report concluded that the subject property is suitable for development if the geotechnical constraints are taken into account and the designs incorporate measures to accommodate the on-site material properties.

- **Vegetation**

Specialist ecological site assessment confirmed the site is more representative of a degraded area and habitat has been transformed and should be classified as such.

It's the reasoned opinion of the specialist that the development may continue if all mitigation measures are implemented and all areas of medium or high sensitivity are avoided where feasibly possible. Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as Medium sensitivity. The wetland buffers as delineated and recommended by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance.

No red data fauna or other fauna were found on the site.

- **Wetland and Recommended Buffer**

The wetland and pan associated vegetation unit (VU2) had been rewarded with Medium sensitivity to cater for the sensitivity requirement as possible habitat for sensitive species. The dam within the buffer have been included as Medium Sensitivity, since it is within a residential area on private property and therefore not likely to sustain red listed species, but still constitute important habitat extension for VU2 (ecological corridor). The area is generally thought to be impacted and degraded (and

therefore not awarded High sensitivity which is usually awarded to sensitive features such as wetlands and pans) and no signs of red listed species were found to occur.

- **Buffer Determination**

GDARD requires a buffer zone of 30m around wetlands. The end-use objective for a buffer zone is the protection of a core area. Pressey (1997) states that one of the biological benefits of buffer zones is that it enlarges the natural habitat and ecosystem services of a natural area. Barborak (2014) states that it "does not work to legislate a simple boundary (such as 2 km around the exterior of a PAN and also just calling an area a buffer without any efforts to control land use and development, or restore degraded ecosystems".

The negative effect of a degraded ecosystem on a natural area could be equally devastating than development in that system. Garrat (2006) also argues that "a variable buffer zone model offers an effective means of co-managing the relationship between urban and natural areas". Based on the transformed condition of the buffer zone (comprising infilling, rubble, litter and pioneer weedy and alien invasive species) the 15m buffer zone as determined from the Buffer Tool (DEFF) is recommended on condition that the 15m area is rehabilitated and planted with indigenous species occurring around wetland (see recommendations in this report).

It is thought that a rehabilitated 15m buffer zone is more realistic, and it would greatly enhance the total wetland ecosystem and its functioning. A 30m buffer zone would serve no purpose since it would not be feasible to rehabilitate such a large area and topographically it would not serve a function in protecting the wetland system as explained earlier in the report.

A 15 m buffer is therefore recommended.

F. ENVIRONMENTAL IMPACT ASSESSMENT

In terms of the environmental assessment, no significant impacts were identified that could not be adequately mitigated. The No-Go option would mean the proposed development would not go ahead, with probably the following implications:

- The No-go alternative would result in the maintenance of the status quo and leave the land vacant with no economic or social benefit in return.
- High levels of habitat degradation and transformation due to present and historic activities on site.
- Invasive vegetation would probably continue to spread in areas where land is vacant and not actively used in its entirety.
- No clearance of present alien species.
- No upliftment of previously disadvantaged individuals via employment opportunities in both phases of the development.
- No contribution would occur to the local economy via the payment of rates and taxes.

G. OPINION OF THE EAP

It is the opinion of Delron Consulting (Pty) Ltd that NO FATAL FLAWS are associated with the proposed shopping centre development on the subject property. All impacts can be adequately mitigated to reduce the risk or significance of impacts to an acceptable level.

It is also the opinion of Delron that this Basic Assessment Report contains sufficient information to allow GDARD to make an informed decision. Delron therefore recommends that the application for Authorisation should be approved on condition that the recommended mitigation measures stated herein are effectively implemented. Please refer to Section 8 below for the mitigation measures.

7. SPATIAL DEVELOPMENT TOOLS

Indicate the application of any spatial development tool protocols on the proposed development and the outcome thereof.

SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, 2013

The recently enacted Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013) delineates five (5) primary development principles (spatial justice, spatial sustainability, efficiency, spatial resilience and good administration) applicable to spatial planning, land development. The application complies with the general principles for land development and land use management, which should be applied as guide in considering any application that impact or may impact upon the use and development of land.

METROPOLITAN SPATIAL DEVELOPMENT FRAMEWORK, 2011

The Integrated Development Plan (IDP) of a municipality, together with the Spatial Development Framework/s (SDF) forming part thereof are, by virtue of the provisions of section 35 of the Local Government Systems Act 32 of 2000 (the Systems Act), the principle planning instruments which guide and inform all planning and development and all decisions with regard to planning, management and development in the municipality.

The MSDF is not a blueprint or master plan, but a framework to give strategic guidance in respect of the location and vision of development within the municipality. In terms of the MSDF, the area in question is earmarked as urban which includes supporting facilities such as churches, home business, business facilities, schools, residential, etc. In view of the aforesaid the proposed development is in line with the MSDF.

AREA 34 LOCAL SPATIAL DEVELOPMENT FRAMEWORK

According to the Area 34 LSDF, the application site forms part of a mix used corridor zone of which the following land uses are permitted on the application:

- Residential buildings
- Residential establishment
- Community orientated uses
- Home undertakings and professional home office
- Place of instruction
- Place of public worship
- Place of refreshments
- Institutions
- Business buildings
- Medical orientated uses
- Retail

In view of the aforesaid, it is evident that the proposed rights complies with the Local Spatial Development Framework for the area, and the purpose of the application is to take the existing business rights of Erf 488 Brentwood Extension 1 and spread it over the two properties.

8. RECOMMENDATION OF THE PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the Environmental Assessment Practitioner as bound by professional ethical standards and the code of conduct of EAPASA).	**YES X**	~~NO~~

If "NO", indicate the aspects that require further assessment before a decision can be made (list the aspects that require further assessment):

Not Applicable

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application:

It is cautiously recommended by the EAP that the proposed development receive Environmental Authorisation, subject to the following conditions and mitigation measures:

- Any decision regarding the granting of authorisation of this activity should also be subject to the implementation of all the mitigation and management recommendations as contained in the EMPr.
- An Environmental Management Programme (EMPr) has been compiled and can be found under Appendix H of this document. It is recommended that an Environmental Control Officer be appointed to conduct independent audits to ensure compliance with the EMPr during construction.
- The wetland must be protected by means of a 15 meter conservation buffer where no development is allowed as recommended in the wetland specialist report.
- The wetland and associated 15 meter conservation buffer will be demarcated as no-go areas.
- A Water Use License must be applied for, for impeding and diverting the flow of a water course (Section 21 (c)) and altering the bed, banks, course and characteristics of a watercourse (Section 21(i)) for the construction of the shopping centre and associated infrastructure within the 1:100 year flood line regulated area.
- A stormwater management plan must be developed and approved for the proposed development by the relevant authorities before construction commences. This plan must make provision for trapping pollutants before the water is released into the wetland and also make provision that the force of the water is broken before releasing it into the system. In addition the water should be released at various points so as to prevent large-scale erosion.
- The design and implementation of the infrastructure and services provision are to be done in accordance with engineering specifications so as to comply with the regulations and standards of the City of Ekurhuleni Metropolitan Municipality.
- The construction of all structures, roads and implementation of services must be in accordance with the specifications of the geotechnical engineering assessment. Such specification will be in response to site specific soil characteristics, gradient and anticipated runoff.

9. THE NEEDS AND DESIRABILITY OF THE PROPOSED DEVELOPMENT (as per notice 792 of 2012, or the updated version of this guideline)

NEED

6.1 There is an irreversible trend in South Africa and Internationally of people migrating towards urban areas. The search for better welfare and economic sustainability is spearheading migration from rural areas to urban areas. In 1990 the world population was 2.5 billion and it has reached 7 billion in 2011.

According to the 2011 Census and as indicated in Figure 6 Ekurhuleni Metropolitan Municipality has experience a slower population growth rate (2,5%) for the period 2001 – 2011 compared with that of 1996 to 2001 (4,1%). Although the population growth rate is slower for the period 2001 – 2011, 28,8% of the population within Ekurhuleni is unemployed.

It is however important to note that the increase in urban population figures and unemployment rates have not been supported by a corresponding increase in economic opportunities and job creation. There is therefore enormous pressure on cities, not only to create sustainable economic, and job opportunities, but also to establish additional accommodation.

In view of the aforesaid the proposed development will create much needed working opportunities during the construction and operational phases for the 28,8% of the Ekurhuleni population that is unemployed.

6.2 The economy development that took place in the country in the last couple of years indicated a definite movement by investors to assist the rapid residential increase in the areas by developing small business nodes in close proximity of these residential areas. Regarding the area under consideration, it can be stated that a lot of money had been invested over the last couple of years in residential development. The economy is very vibrant and pressure is being encountered by the Local Authority to establish/extend the economic potential areas, which will supply in the need of the surrounding community and that will create more working opportunities.

As mentioned earlier, Erf 488, Brentwood Extension 1 is already zoned “Business 2” and the existing land use rights allows for a shopping centre of approximately 26 222 m2. The purpose of the rezoning is not to increase the floor area but to spread the existing business rights over Erven 440 and 488, Brentwood Extension 1. By spreading the business rights over two the properties the owner will be able to develop a shopping centre that will be integrated with the environmental sensitive area located on the southern portion as well as providing public transport facilities and appropriate onsite parking. This will result in a more sustainable development that is integrated with the existing urban form.

6.3 Nodes are one of the major structuring elements of cities / towns, together with movement networks, corridors and activity spines. The movement system within a city / town is the backbone of its own economy, and the design of the movement also determines the levels of convenience for users, local residents or visitors from other cities or rural areas. For the movement system and its infrastructure to be viable, the level of utilization thereof in an efficient and convenient manner is a must. The need to strengthen the activity corridor (Great North Road) and the mixed land use node on the corner of Celia Nestadt Road and Great North Road has been identified in the LSDF for the area.

“Densification” goes hand-in-hand with this approach of intensification within the identified nodes and adjacent to Corridors and Activity Spines. Here we refer to the surrounding agricultural holdings that are rapidly being developed for medium and high density residential development.

The purpose of the proposed development is not only to exercise the existing business rights more optimally, but to supply in the need for well located supporting facilities that is easily accessibility and convenient to access for the surrounding areas.

The intensification and strengthening of this existing activity corridor and mixed land use node via this application will lead to job creation, an efficient and economically viable public transport system, economic growth, etc. therefore promoting the vision of the local authority as identified in the approved IDP and SDF.

DESIRABILITY OF THE PROPOSED TOWNSHIP

7.1 According to the land use policy for the area, the application site forms part of a mixed land use corridor that allows for high density residential development as well as supporting facilities such as business buildings, retail, etc. to be developed adjacent the identified mixed land use corridor.

As the intention of the application is to spread the existing land use rights of Erf 488, Brentwood Extension 1 over two properties (Erf 440 and 488) no additional rights are being created via this application. Although the existing rights are only being spread over two properties, the proposed development is still in line with the approved land use policy.

7.2 It is also true that one of the major conditions for the successful development of any business development is that the erven must be accessible to the market area, residential areas, business areas, major roads, supporting facilities, etc. Measured against this norm, it is evident that the site is excellently located with regards to the major access roads, located in close proximity to Great North Road and Celia Nestadt Road.

7.3 The income that will be generated by the Local Authority via rates and taxes, payment for services, etc. will assist Council to deliver the required services and it will also lead to new developments as the service infrastructure of the local authority will be extended via this development. This development will therefore have a multiplier effect on the economic growth within the municipal area.

7.4 With regards to services it can be stated that the proposed development will require certain upgrades to the bulk services of Council. These upgrades will be attended to by the developer and the services will be adequate to accommodate the proposed development.

7.5 A widely held and common principle of land use management programs today focuses on sustainability, with the main emphasis on environmental preservation. The establishment of a shopping centre development will result in the use of public transport being promoted and any development promoting public transport will minimize the use of private vehicles that is directly linked to greenhouse gasses, climate change and thus sustainability. The integration of business opportunities with the surrounding residential areas will also minimize the travel times to and from the business centers. Therefore the proposed development is in line with all the broad criteria for sustainable development.

7.6 With regards to job creation, it is estimated that more than 150 new job opportunities will be created once the shopping centre are fully developed. There will also be job created during the construction phase that will have multiple affect on the economy of the Ekurhuleni Metropolitan Municipality. Any development that will promote job creation with more than 150 new job opportunities should be favourable considered.

10. THE PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED *(CONSIDER WHEN THE ACTIVITY IS EXPECTED TO BE CONCLUDED)*

30 years.

11. ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR) (must include post construction monitoring requirements and when these will be concluded.)

If the EAP answers "Yes" to Point 7 above then an EMP is to be attached to this report as an Appendix

EMPr attached	**YES**

SECTION F: APPENDIXES

The following appendixes must be attached as appropriate (this list is inclusive, but not exhaustive):

It is required that if more than one item is enclosed that a table of contents is included in the appendix

A	LOCALITY MAP
B	SITE PHOTOGRAPHS
C	LAYOUT PLAN
D	FACILITY ILLUSTRATION
E	PUBLIC PARTICIPATION
E.1	PROOF OF NEWSPAPER ADVERTISEMENTS
E.2	PROOF OF SITE NOTICE
E.3	WRITTEN NOTICES ISSUED
E.4	COMMUNICATIONS TO AND FROM I&APS
E.5	MINUTES OF ANY PUBLIC AND/OR STAKEHOLDER MEETINGS
E.6	COMMENTS AND RESPONSES REPORT
E.7	AUTHORITY CORRESPONDENCE
E.8	COPY OF THE REGISTER OF I&APS
E.9	LIST OF STATE DEPARTMENTS
F	WATER USE LICENSE(S) AUTHORISATION, SAHRA INFORMATION, SERVICE LETTERS FROM MUNICIPALITIES, WATER SUPPLY INFORMATION
G	SPECIALIST REPORTS
H	EMPR
I	OTHER INFORMATION

CHECKLIST

To ensure that all information that the Department needs to be able to process this application, please check that:

- Where requested, supporting documentation has been attached;
- All relevant sections of the form have been completed.

APPENDIX A: LOCALITY MAP

DESCRIPTION

Figure 1: Locality Plan

PROPERTY

Erven 440 and 488 Brentwood Extension 1

Legend

The Site

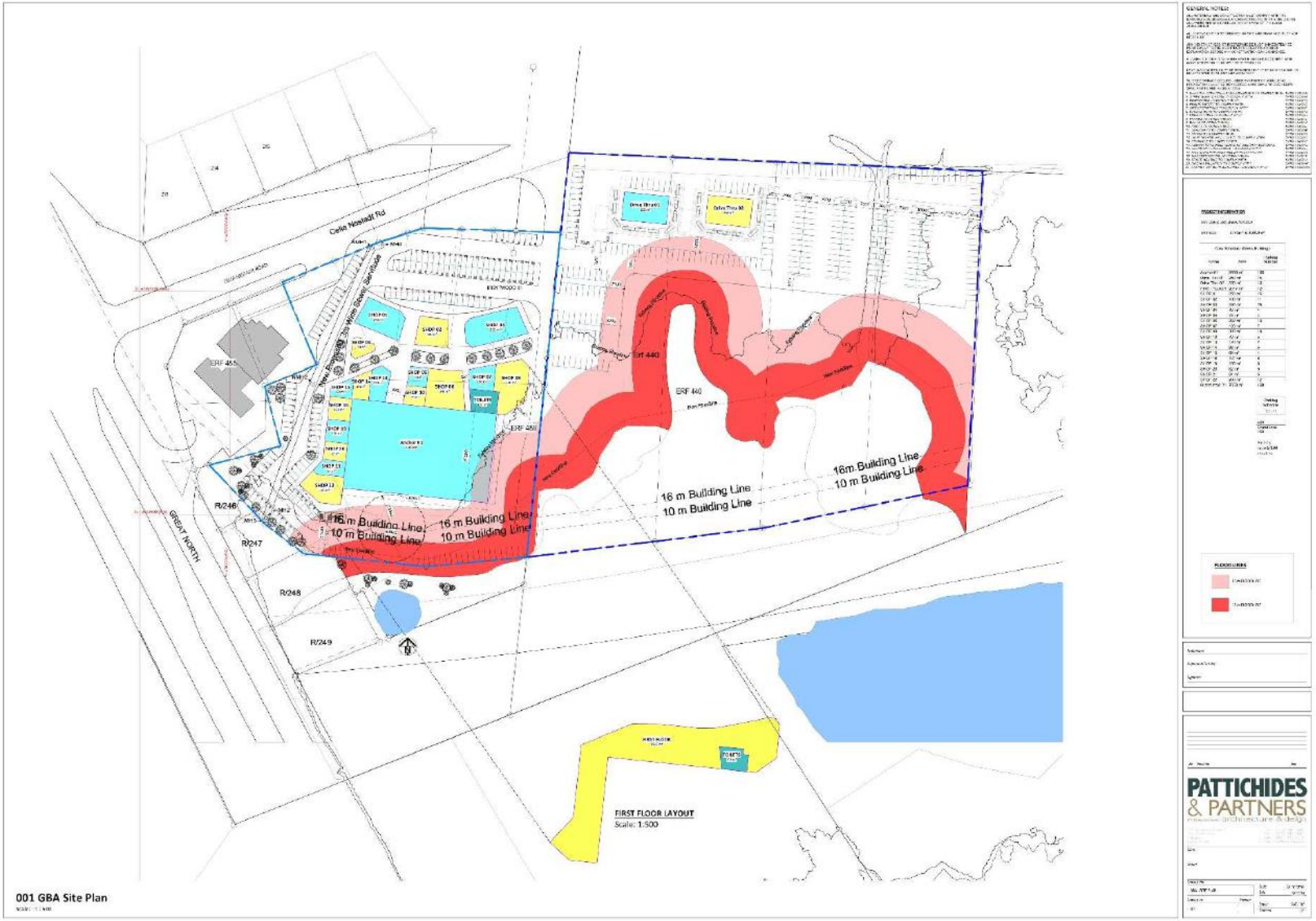
PROJECT

Application for Environmental Authorisation for the Proposed Shopping Centre Development on A Portion of Erf 440 and A Portion of Erf 488, Brentwood Extension 1 within the City of Ekurhuleni

delron ENVIRONMENTAL assessment practitioners

APPENDIX B: SITE PHOTOGRAPHS

APPENDIX C: SITE LAYOUT PLAN



APPENDIX D: FACILITY ILLUSTRATION: N/A

APPENDIX E: PUBLIC PARTICIPATION

APPENDIX E.1: PROOF OF NEWSPAPER ADVERTISEMENTS

Publication Name	*To be included in Final BAR*
Date Published	*To be included in Final BAR*

APPENDIX E.2: PROOF OF SITE NOTICE

Site Notice Position	Latitude	Longitude
	To be included in Final BAR	*To be included in Final BAR*
Date Published / Placed	*To be included in Final BAR*	

To be included in Final BAR

APPENDIX E.3: WRITTEN NOTICES ISSUED

To be included in the FBAR.

APPENDIX E.4: COMMUNICATIONS TO AND FROM I&APS

To be included in the FBAR.

APPENDIX E.5: MINUTES OF ANY PUBLIC AND/OR STAKEHOLDER MEETINGS

One-on-one meetings with key I&APs, to be held upon request. No public meeting or focus group meeting were conducted at this stage.

APPENDIX E.6: COMMENTS AND RESPONSES REPORT

**** As this is the first announcement of the project and comment opportunity on the Draft Basic Assessment Report, no comments have been received to date. Any comments received from organs of state or any other I&APs on the DBAR will be included in the Final Basic Assessment Report.***

Name of Contact Person	Company / Entity	Date	Aspect	Question / Comment / Issue Raised	Response
					(i)

APPENDIX E.7: AUTHORITY CORRESPONDENCE

To be included in the FBAR.

APPENDIX E.8: REGISTER OF I&APS

To be included in the FBAR.

APPENDIX E.9: LIST OF STATE DEPARTMENTS

To be included in the FBAR.

APPENDIX F: WATER USE LICENSE(S) AUTHORISATION, SAHRA INFORMATION, SERVICE LETTERS FROM MUNICIPALITIES, WATER SUPPLY INFORMATION

APPENDIX G.1

Geotechnical Report

Geotechnical investigation of Stand 440 Brentwood Extension 1 – Brentwood Boulevard Shopping Centre

(Ekurhuleni Metropolitan Municipality)

Client

Soleprops 39 (Pty) Ltd
P O Box 10371
Fonteinteit
1464

Tel: 011 615 1967
Fax: 011 615 1774

Consultant

Geo Buro
Geotechnical Surveys

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S P KOK Pr Sci Nat
Engineering geologist
spkok@telkomsa.net

Report no: K8203-01
Project no: 8203-GB

April 2014

GEOTECHNICAL REPORT: BRENTWOOD BOULEVARD SHOPPING CENTRE

Title: Geotechnical investigation of Stand 440 Brentwood Extension 1 – Brentwood Boulevard Shopping Centre (Ekurhuleni Metropolitan Municipality)

Prepared by: Geo Buro cc
Geotechnical Surveys
P O Box 15147
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0140

Client: Soleprops 39 (Pty) Ltd
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Tel: 011 615 1967
Fax: 011 615 1774

Project no: 8203-GB

Report no: K8203-01

Project Team: S P Kok

D G Purnell

Mrs W Labuschagne

Date: April 2014

Approved for Geo Buro Geotechnical Surveys

Table of contents

APPENDICES

1. Introduction

This firm was appointed by Mr Costa Hajimarkos of Soleprops 39 (Pty) Ltd to do a geotechnical investigation on stand 440 Brentwood Extension 1 for the proposed development of a shopping centre. The aim of the investigation was to study the available geotechnical information, do an in situ inspection and to compile a report on the geotechnical conditions of the site with conclusions and recommendations. The assessment was carried out by S P Kok Pr Sci Nat (Engineering Geologist).

The purpose of the investigation is to:

- Determine the geological origin of the material on site.
- Determine the engineering properties of the different material layers.
- Give recommendations regarding the founding of the proposed structure.

2. Site location and description

The site is approximately 7,6ha in area, being situated on Stand 440, Brentwood Extension 1, Benoni, Gauteng. The site is bordered to the north and west by surfaced roads (Celia Nestadt Road and Great North Road respectively), to the east by an undeveloped stand, and to the south by a developed residential area.

The southern part of the site is a wetland. With the exception of the extreme eastern and western parts of the site, the majority of the natural soil profile in the northern part of the site has been covered by imported fill, which is in the form of a slightly clayey sand in the order of 0,8m thickness in the western one-third, and household refuse and builders' rubble in the order of 1,0m to 1,5m thickness in the eastern two-thirds of the site. The northern part of the site is grass-covered, generally with very occasional trees up to approximately 16m in height, the tree cover being dense in the north-eastern corner of the site. The natural ground surface of the site generally drains gently towards the south. Two minor water courses flow in a north-south direction across the northern part of the site.

Apart from a small derelict brick building in the eastern part of the site, there are no structures on the site. Overhead high-tension electricity lines run parallel to the southern boundary; the servitude width is in the order of 60m within the southern boundary of the site.

The site locality is indicated on drawing number *8203-01: Locality Plan with geology*.

A coordinate at the centre of the investigated area is approximately Lo 29 Y0070286 X2892418.

3. General geology

The available geology map shows that the site is underlain by sandstone and mudrock of the Vryheid Formation of the Ecca Group of the Karoo Supergroup. Fill overlying sandstone was encountered on the site and confirmed the expected geology.

4. Groundwater conditions

Groundwater was encountered in all the test pits apart from test pits 1 and 5 along the western boundary of the site. Water seepage was generally shallow and subsoil drains will probably have to be installed to drain the area effectively.

5. Available information

Maps

- The published geology map of South Africa (Government Printer) at a scale of 1 : 1 000 000.

Publications

- SACS (Statigraphy of South Africa) Handbook 8, Part 1 Geological Survey (now the Council for Geoscience).
- Brink, A B A (1979). Engineering geology of Southern Africa (Volume 3). Building Publications.

6. Climate

The site lies within the Highveld climatic region, the climate being described as warm temperate with summer rainfall.

The average daily maximum temperature is in the order of 28°C in April and 18°C in July. The rainy season is from October to March, with an average rainfall of about 740mm. Thornwaite's classification indicates sub humid, warm conditions with deficient moisture in all seasons.

The Weinert N-value is in the region of 2,4 which indicates that predominantly chemical decomposition of the underlying rock has taken place.

7. Investigation methods

The available information such as the geology map and groundwater data was studied. Nine test pits were excavated and the soil profiling done. Material samples were taken and laboratory tests were conducted. Laboratory testing included foundation indicator tests and CBR (Californian Bearing Ratio) tests. The southern part of the site is inaccessible to the presence of dams.

The soil profile descriptions are given in Appendix A and the laboratory test results are given in Appendix B. The test pit positions are shown on drawing number *8203-02: Site layout*.

7.1 Soil Profile

The soil profile is fairly homogeneous across the site and similar materials were encountered in all the test pits.

A generalised soil profile can be described as follows:

0,0 -0,8m	*Moist to very moist, dark brown and reddish brown, loose to medium dense, silty sand with builders rubble and house refuse; Fill.*
0,8-2,0m	*Very moist, yellow-olive, soft, fine to medium grained clayey sand with roots; Transported.*
2,0-3,1m	*Very moist, dark red, dense to very dense, fine to medium grained clayey sand; Transported. P = 200 kPa.*

Notes: Water seepage at 1,5m. No refusal of the TLB occurred.

7.2 Laboratory test results

General

The samples taken classified mostly as clayey sand (SC), clay (CL) or inorganic clay (OL).

Seven disturbed samples were taken from the test pits excavated on the site. Seven foundation indicator tests were done and one CBR (Californian Bearing Ratio) test. The materials on site are fairly variable as can be seen from the laboratory test results and the soil profiles.

Indicator tests

Most of the materials sampled and tested are finer than the 2mm and high percentages are finer than the 0,075mm fraction. All of the samples classified as SC, CL or OL – clayey sand and clay.

From the grading analysis it is evident that the material has a clay content (minus 0,002mm fraction) of between 4 and 43 percent (average 26,3 percent). The silt fraction (less than 0,075mm) varies between 21 and 78 percent with an average of 51,4 percent. The grading modulus of the samples varied from 0,37 to 1,59 with an average of 0,86 indicating generally fine material.

All of the samples show fairly significant plasticity and the Atterberg Limits are summarised as follows:

Atterberg Limits	**Average**	**Minimum**	**Maximum**
Liquid Limit	37.3	23	49
Plasticity Index	14.9	8	21
Linear shrinkage	7.1	3.5	10.5
PI Whole sample	11.3	4	17

It is evident that the Liquid Limits, Plasticity Indices (PI) and Linear Shrinkage of the samples are generally on the high side and consequently the heave potential is *low to medium* (according to Van der Merwe).

Heave potential

The samples classify generally as having a low to medium heave potential and one sample 1(B3) showed a medium heave potential. The expected movement due to heave should be less than 25mm.

CBR (Californian Bearing Ratio)

One CBR samples were tested. It is generally expected that the clayey sand material near surface across the entire site will classify as G8. The in situ materials are therefore generally suitable for use in fill, but not in layer works for roads and foundations.

7.3 Collapse potential and compressibility

The residual materials are generally compressible and some ground movement can be expected when a load is placed on the material.

7.4 Excavatibility

No serious excavation problems were experienced in any of the nine test pits excavated to depths of around 2m. With a large excavator the site will classify as soft excavation to a depth of 1,5m.

7.5 Sidewall stability of excavations

Some side wall instability was noticed and groundwater seepage occurred in most test pits. All excavations deeper than 1,5m must be shored according to health and safety regulations.

7.6 Slope stability

The area is fairly flat at approximately 2 percent on average in a southern direction. In general no slope stability problems are foreseen.

7.7 Construction materials

According the TRH14, the materials classify as G8 and according to the U.S Highway classification all the materials have poor subgrade rating. The in situ materials are therefore suitable for use as fill but not in engineered layer works. For roads or foundations suitable material must be imported.

7.8 Zonation

The site is divided into different zones based mainly on the presence of fill and where seepage water has been encountered (refers to drawing number 8203:02). The site is classified as follows:

Zone H2
Zone H2/P (fill)
Zone H2/P (fill and seepage)
Zone H2/P (seepage)

8. Foundation design and precautionary measures

The site classification is mostly H2/P according to the NHBRC soil classification system.

The entire site is underlain by residual sandstone with some fill material present near surface. It is recommended that the foundation be done by compacting the in situ material and placing an engineered fill to accommodate the expected ground movement. This is also dependent on the loads of the structure.

Shallow groundwater seepage is expected, and the site drainage will have to be addressed probably by subsoil drains.

No wet services should be installed below the structures as far as is practically possible.

It is recommended that the excavations (for foundations and underground services) be inspected on the site during construction. This should ensure that conditions at variance to that described can be noted and the necessary adjustments made.

9. Conclusions and recommendations

The regional geology map shows that the site is underlain by residual sandstone of the Vryheid Formation of the Ecca Group of the karoo Supergroup.

The site is presently largely undeveloped apart from dams in the southern part of the site.

It is estimated that the maximum amount of movement due to heave is less than 25mm. Indications are that the amount of movement due to the compressibility of the near surface materials will be significant (depending on the loads).

The foundation design is dependent on the founding levels and the loads of the structure. It is recommended that the foundations be placed on an engineered fill and that the in situ material be compacted to address the expected ground movement.

Excavations (for foundations and underground services) must be inspected on the site during construction.

The in situ material is not suitable for use in engineered layer works, but is considered suitable for use as fill.

The TLB occasionally refused on sandstone and hardpan ferricrete.

A site specific foundation investigation must be done once the site layout is available.

10. Report provisions

The aim of the investigation was to estimate through site investigation; professional judgment and past experience the geotechnical conditions of the site, different soil horizons with their different geotechnical properties, areas subject to a perched water table, and areas of poor drainage, areas underlain by hard rock and to estimate their distribution. However, it is impossible to guarantee that isolated zones of different geotechnical conditions, foundation materials, blanketing layers or any other geotechnical problems have not been missed.

For this reason detailed foundation inspections should be carried out at the time of construction to identify such variances and adjust foundation designs accordingly if need be.

11. References

11.1 GEOLOGICAL MAP
Number and title: Geology Map of South Africa
Scale: 1:1 000 000
Date of publication: 1973
Source: Government Printer

11.2 Jennings, JE, Brink, ABA and Williams, AAB (1973). **Revised guide to soil profiling for Civil Engineering Purposes in SA.** Trans SAICE, Vol 5, No 1, pp 3-12.

11.3 Van der Merwe, DH (1964). **The prediction of heave from the plasticity index and the percentage clay fraction.** Trans SAIC Vol 6, No 6, pp 103-7.

11.4 Brink, ABA, (1979). **Engineering Geology of South Africa.** Vol. 3 published Building Publications, Silverton.

11.5 Burland, JB (1961), **A simplified colour chart for soil identification.** Trans SAICE Vol.3, No.8.

11.6 Jennings, JE & Kerrich, JE (1962). **The heaving of buildings and the associated Economic consequences, with particular reference to the Orange/Free State Gold Fields.** The Civil Engineer in SA. Vol4, No. 11.

11.7 Jennings, DE and Robertson, A Mac G (1974). **Settlement and collapse potential.** Reply to ABA Brink in SAICE Div. Soil Mech. And Found Eng. Newsletter No.2 pp 1-5.

11.8 South African Institute of Civil Engineers/Institution of Structural Engineers (1995). **Code of Practice P: Foundation and Superstructures for Single Storey Residential Buildings of Masonry Construction.** Joint Structural Division, Johannesburg.

11.9 Partridge, TC Wood, KC and Brink, ABA (1993). **Priorities for urban expansion within The PWV metropolitan region. The primacy of geotechnical constraints.** South African Geographical Journal, Vol 75, pp 9-13.

11.10 National Home Builders Registration Council (1999). **Home builders manual Parts 1 and 2.** Revision no. 1 February 1999.

11.11 SAIEG/SAICE (1996). **Guidelines for Urban Engineering Geological Investigations.**

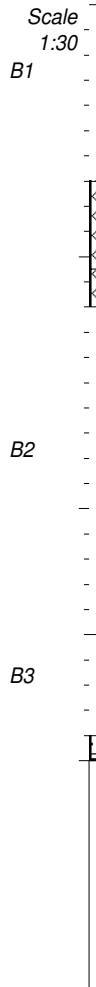
Appendix A: Soil Profile Descriptions

GEOTECHNICAL SERVICES CC

STAND 440
BRENTWOOD EXTENSION 1
BENONI

HOLE No: TP1
Sheet 1 of 1

JOB NUMBER: 6451-JD



0.00 Slightly moist to moist, light olive, dense, medium grained slightly clayey sand.
FILL.
Imported.

0.70 Slightly moist, reddish-brown flecked light orange and dark red, very dense, fine to medium grained clayey sand.
FILL.
Imported.

1.05 Moist to very moist, dark grey and dark brown, dense to very dense, fine to medium grained clayey sand.
FILL.
Imported.

1.20 Moist, light orange-olive mottled dark reddish-brown and black, very dense, fine to medium grained clayey SAND with iron concretions up to 15mm in diameter.
Transported and pedogenic (? - possibly residual sandstone).
P=250 kPa.

2.50 Moist to very moist, dusky red mottled light yellow-orange and light grey, very dense, fine to medium grained clayey SAND.
Residual sandstone
P=300 kPa.

2.90 Light grey blotched dark yellow-orange, medium to highly weathered, medium grained, closely jointed, very soft ROCK; sandstone.
P=500 kPa.

3.00

NOTES

1) No groundwater seepage.

2) Backactor refusal on very soft sandstone rock at 3,0m.

3) Disturbed samples taken; B1 at 0,3m, B2 at 1,8m and B3 at 2,7m.

CONTRACTOR : LETSATSI HIRE
MACHINE : CAT 428B
DRILLED BY :
PROFILED BY : DG PURNELL PR.SCI.NAT.

INCLINATION :
DIAM : TRENCH
DATE : 2014-02-19
DATE : 2014-02-19

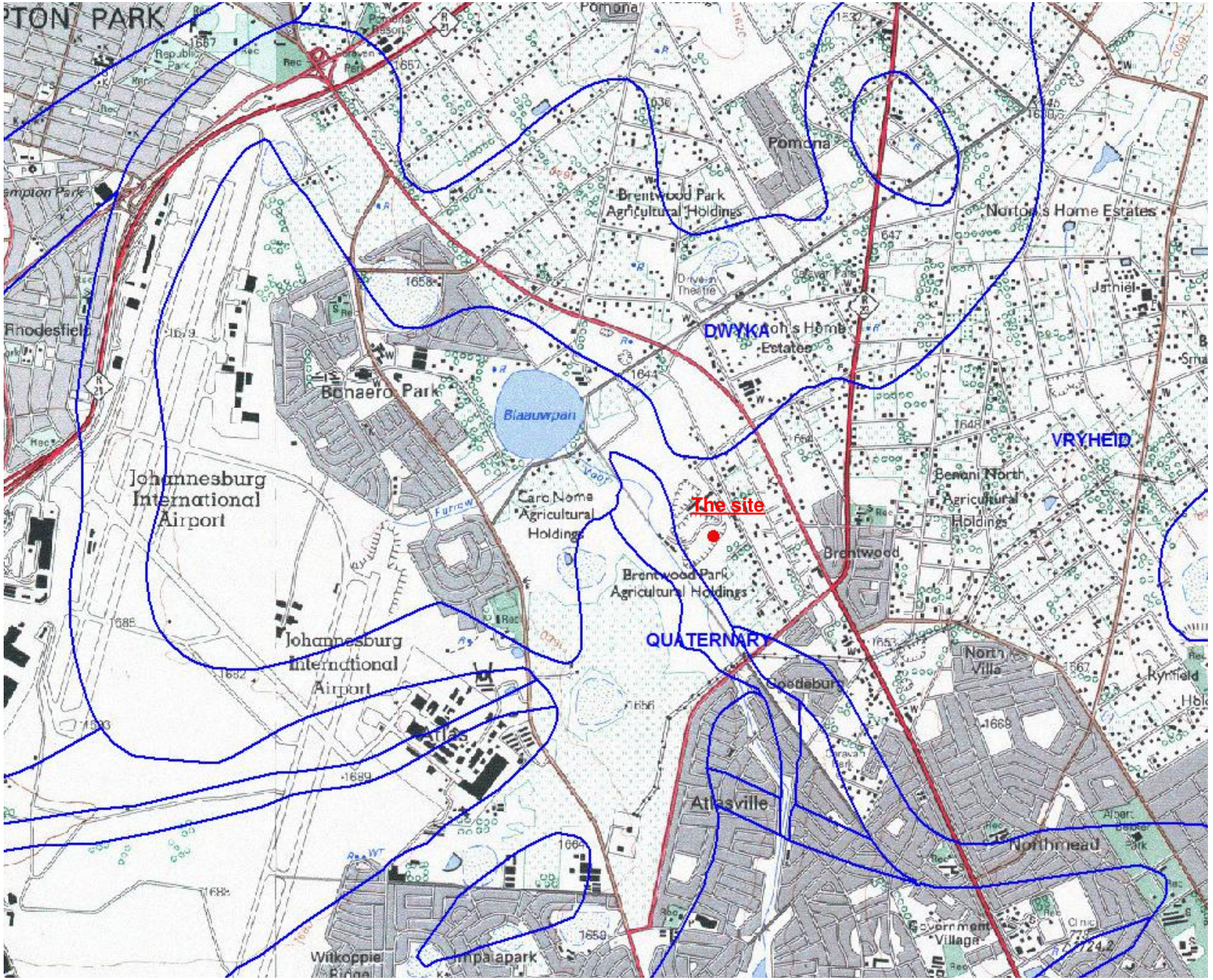
ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP1

TYPE SET BY : K STEWART
SETUP FILE : SPROF.SET

DATE : 20/02/14 14:46
TEXT : ..\STAND4~1\TP'S1-~1.TXT

Appendix C: Drawings



Geo Buro

Geotechnical Surveys

P O Box 15147
Lyttelton
0140

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S P Kok
Engineering Geologist

Cell: 083 556 0968
spkok@telkomsa.net

N
W E
S

Not to Scale

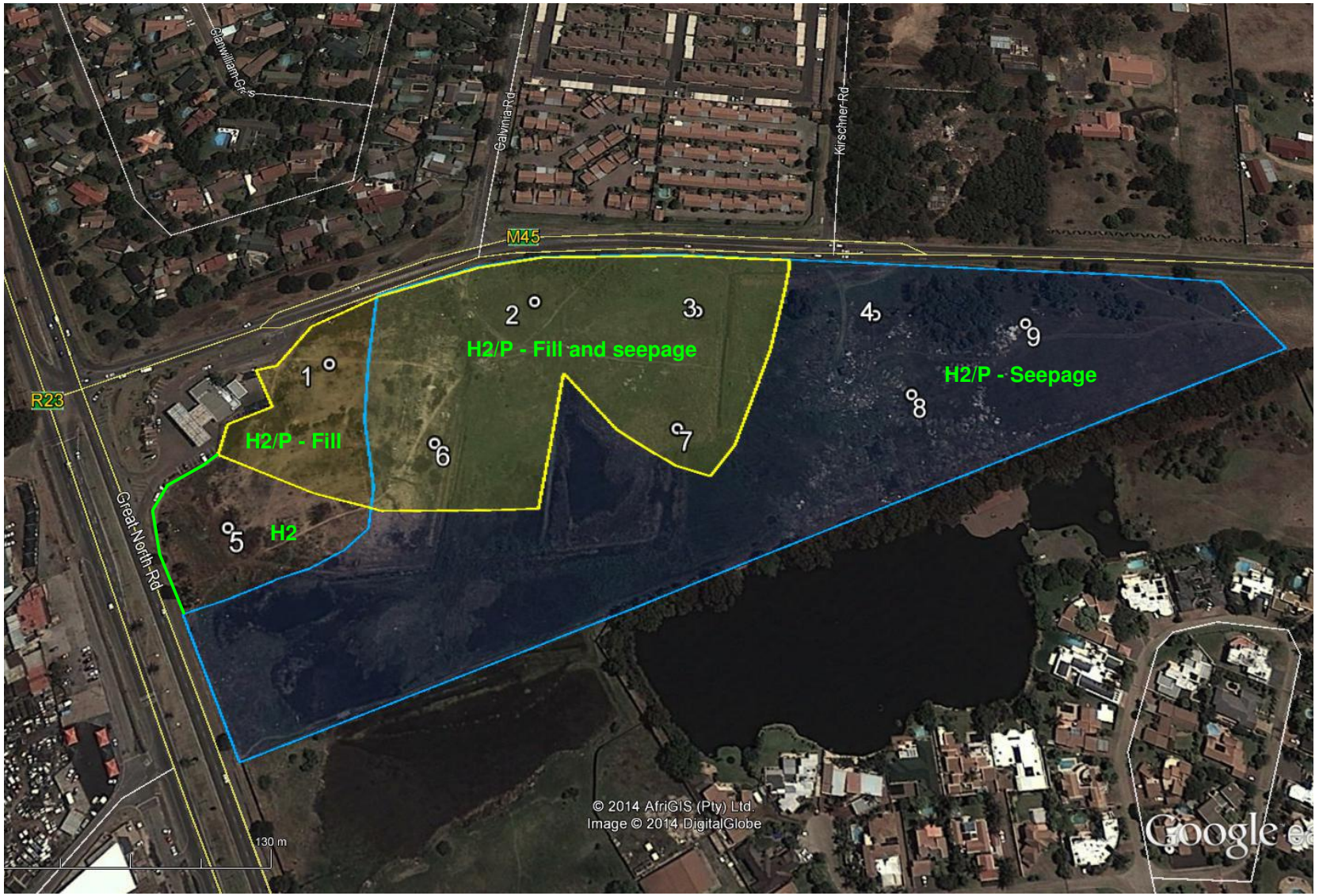
Client:

Soleprops 39 (Pty) Ltd

Site:

Brentwood Boulevard Shopping Centre

DWG No: 8203-01: Locality with geology map



H2

H2/P - Fill

H2/P - Seepage

H2/P - Fill and seepage

Geo Buro

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0140

Tel: 012 664 3116
Fax: 012 664 8778

S P Kok
Engineering Geologist

Cell: 083 556 0968
spkok@telkomsa.net

N
W E
S

Not to Scale

Client:

Soleprops 39 (Pty) Ltd

Site:

Brentwood Boulevard Shopping Centre

DWG No: 8203-02: Zonation map

APPENDIX G.2

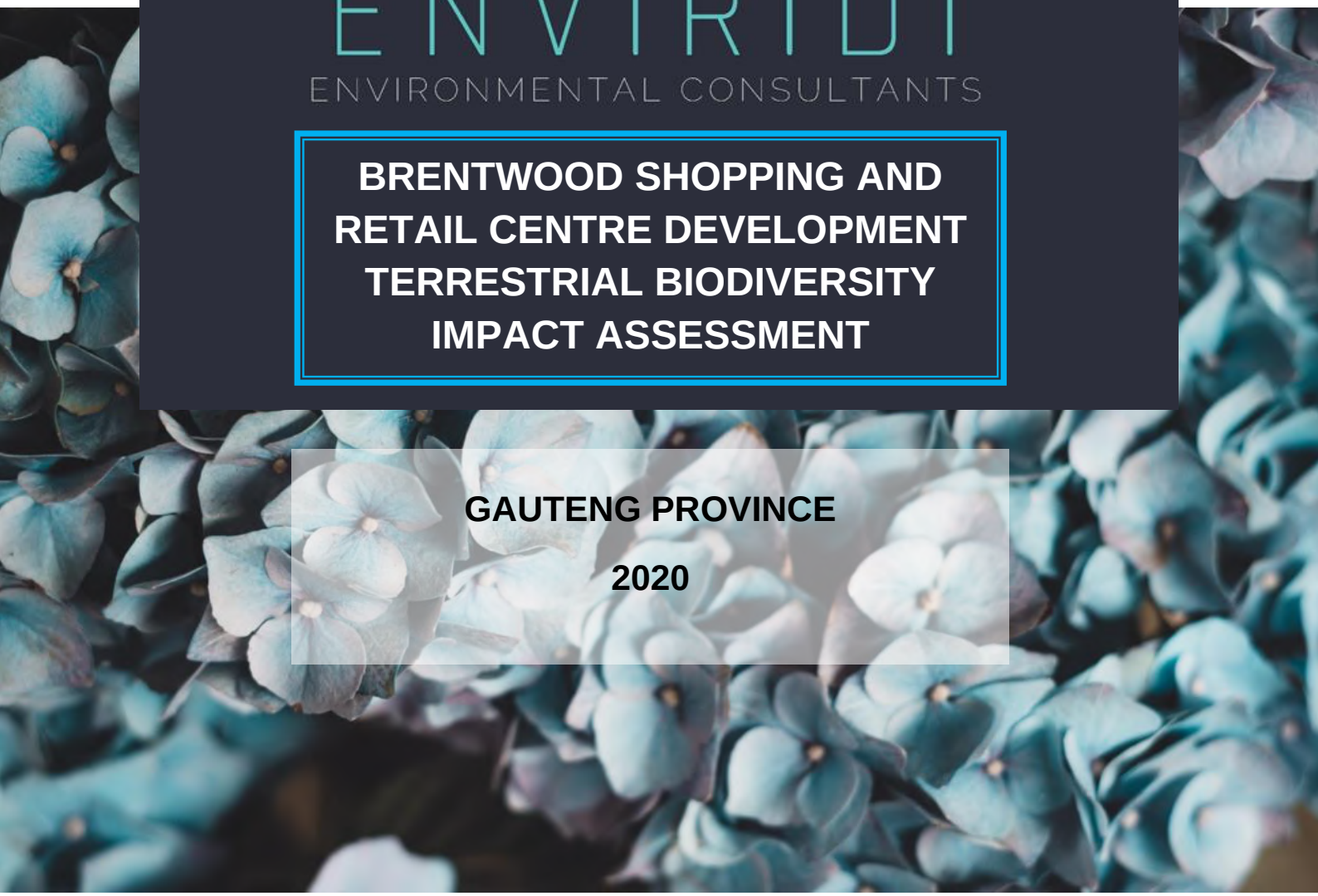
Enviridi Environmental Consultants (Pty) Ltd

Terrestrial Biodiversity Impact Assessment

ENVIRIDI

ENVIRONMENTAL CONSULTANTS

BRENTWOOD SHOPPING AND RETAIL CENTRE DEVELOPMENT TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT



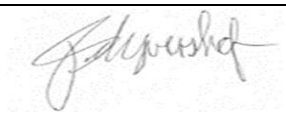
GAUTENG PROVINCE

2020

DOCUMENT DETAILS & HISTORY

Report	**BRENTWOOD SHOPPING CENTRE DEVELOPMENT - TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT**		
Client	Index Integrated Rural and Urban Development Expertise (Pty) Ltd		
Responsible Person	Dr Andries Gouws / Ms Marchelle Terblanche index@iafrica.com; marchelle1@vodamail.co.za		
Report Number	INX-BW-2020	**Report Status**	Final Draft
Draft Report	18 August 2020	**Final Report:**	18 August 2020 Revision: 16 September 2020

DOCUMENT INFORMATION

Responsible person	**Date**	**Position**
Ms C Lambrechts	17 August 2020	EAP – Senior Specialist
Signature		
Responsible person	**Date**	**Position**
Mr J Schrijvershof	18 August 2020	Senior Specialist & Peer reviewer
Signature		

LIMITATIONS AND ASSUMPTIONS

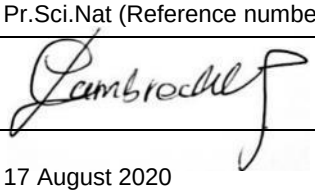
- No alternatives are known for the Brentwood activities provided by the client at this stage of the process. However, during the revision it was brought forward as a possibility to move the placement of the infrastructure to avoid buffers delineated, specifically those delineated for the wetlands (subject of a separate report);
- The site had recently been burnt and new vegetation were beginning to show in various sections, but this could have influenced the observations represented within this report in terms of number of species located and identified;
- A large freshwater dam (artificially created) was visible on the aerial footage within the 200m buffer, but these were located within the neighbouring private properties, specifically the Oakmont Villas Complex and the Brishona Lodge. These are not located within the footprint area but within the 200m GDARD required buffer which was included in the investigation where possible;
- It is assumed that species flowering only during specific times of the year could be confused with a very similar species of the same genus;
- Some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely;
- Late winter conditions were encountered during the time of this study (August 2020). GDARD requires summer assessments to be conducted and this should be noted as a limitation to this report. However, based on the field observations and the low sensitivity delineated to the various vegetation units, the study conducted should be sufficient for the purposes intended;
- In order to obtain a comprehensive understanding of the dynamics of the vegetation of the study area, surveys should ideally have been replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible and this vegetation survey was conducted in one season;
- Data collection in this study relied heavily on data from representative, homogenous sections of vegetation units, as well as general observations, analysis of satellite imagery from the past until the present, generic data and a desktop analysis.

- No scientific data was collected or analyzed for the calculation of ecological veld condition. Any comments or observations made in this regard are based on observations, the expert knowledge and relevant professional experience of the specialist investigators;
- Wetlands occur within the project area. A Wetland specialist should be consulted to delineate, prescribe buffers and assess the wetlands as it falls outside the scope of this report. Artificial channels consisting of hydrophytic vegetation were delineated as low sensitivity based on the fact that they convey stormwater from the road and were artificial in nature and filled with litter;
- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

DECLARATION OF INDEPENDENCE

The specialist investigator responsible for conducting this particular specialist study declares that:

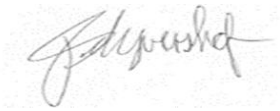
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favorable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being a member of the general public;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse the proposed development, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;
- I do not have any influence over decisions made by the governing authorities; should I, at any point, consider myself to be in conflict with any of the above declarations, I shall formally submit a Notice of Withdrawal to all relevant parties and formally register as an Interested and Affected Party;
- I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant;
- I have expertise and experience in conducting specialist reports relevant to this application, including knowledge of the Act, regulations and guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- All the particulars furnished by me in this document are true and correct; and
- I realize that a false declaration is an offence in terms of Regulation 71 of NEMA and is punishable in terms of section 24F of the Act.

Author	Ms Corlien Lambrechts B.Sc. (Hons) Environmental Management, Zoology Pr.Sci.Nat (Reference number: 009135)
Signature of Specialist	
Date	17 August 2020

DECLARATION OF INDEPENDENCE - REVIEWER

The specialist investigator responsible for conducting this particular specialist study declares that:

- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favorable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being a member of the general public;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse the proposed development, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;
- I do not have any influence over decisions made by the governing authorities; should I, at any point, consider myself to be in conflict with any of the above declarations, I shall formally submit a Notice of Withdrawal to all relevant parties and formally register as an Interested and Affected Party;
- I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant;
- I have expertise and experience in conducting specialist reports relevant to this application, including knowledge of the Act, regulations and guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- All the particulars furnished by me in this document are true and correct; and
- I realize that a false declaration is an offence in terms of Regulation 71 of NEMA and is punishable in terms of section 24F of the Act.

Author	Mr Joppie Schrijvershof Ecological Science (Pr. Sci. Nat -115553)
Signature of Specialist	
Date	17 August 2020

EXECUTIVE SUMMARY

This document has been prepared and submitted by Enviridi Environmental Consultants (Pty) Ltd (EnviRidi) to the client: Index Integrated Rural and Urban Development Expertise (Pty) Ltd in response to a request for a biodiversity impact assessment as part of the Environmental Impact Assessment process and Water Use License application for the Brentwood Shopping Centre proposed in the Gauteng Province area.

The project area is located in the Gauteng Province near Brentwood on the corner of the Great North Rd/R23 and Celia Nestadt Road within the Ekurhuleni Metropolitan and District Municipality. The project is located just north west of Northmead and Farrarmere. According to the information provided, the applicant intends to develop a shopping centre consisting of parking, shopping and retail areas, medical suites and drive thru areas.

The project area is located in the Gauteng Province within the Soweto Highveld Grassland, within the Grassland Biome. The Soweto Highveld Grassland has a status of Vulnerable (VU) in terms of the NBA 2018. However, from the aerial footage it is visible that most of the footprint have been disturbed likely based on the fact that the footprint is on the corner of a busy intersection just east of Johannesburg near Benoni.

From the aerial footage, the site falls on an intersection, but seem to be characterised by areas consisting of grassland and wetland in various degrees of disturbance. From the Gauteng Environmental Management Zones (and BGIS), the site falls within Zone 2. Zone 2: High control zone (within the urban development zone) – Intention specified as: This zone is sensitive to development activities. Only conservation should be allowed in this zone. Related tourism and recreation activities must be accommodated in areas surrounding this zone.

Within the National Threatened Ecosystems (2011), sections of the site falls within Rietvleiriver Highveld Grassland (GP 7), which has a status of Critically Endangered (CR). This is in contrast with the NBA 2018, indicating the site falls within Soweto Highveld Grassland (as mentioned above, refer to Figure 2), which has a status of Vulnerable (VU).

The Gauteng C-Plan v3.3 is based on the systematic conservation planning approach (GDARD, 2014). The site is characterised in terms of the Gauteng Conservation Plan (Version 3.3) as a Critical Biodiversity Area (CBA – Important Area), with the surrounding area as Ecological Support Area (ESA). This seems to be based on the fact that some natural vegetation still exists within this zone and associated with wetland terrain and freshwater found just to the south east of the site (within the 200 m buffer). From the data gathered, the site was delineated as possible habitat for Orange listed (OL) plant species and for consisting of natural vegetation.

Flora Baseline: Approximately 444 plant species occur as recorded for the 2628AB QDS (POSA), which consists of 75 families, with the most prominent families recorded from Asteraceae (62 species), Poaceae (58 species), Fabaceae (44 species), Cyperaceae (32 species), Hyacinthaceae (18 species). Thirty-five (35) exotic species and Twenty-six (26) endemic species are known to occur within the larger area Table 4.

Floral species summary for QDS

Number of Families	Number of species	Endemic	Exotic/naturalised species
75	444	26	35

Almost all of these species are classified with a “Least Concern” (LC) IUCN status (Appendix A) and is therefore considered at a low risk of extinction and includes widespread and abundant species. However, some species were not classified as LC and could possibly occur within the study area. Species of conservation concern which occur in the 2628AB QDS are listed in Table 5.

Main findings in terms of Legislation (ToPS Listings, Protected Trees and IUCN):

- *Pelargonium sidoides* - Protected
- *Indigofera hybrida* - VU
- *Habenaria bicolor* - NT
- *Gladiolus robertsoniae* - NT
- *Kniphofia typhoides* - NT

Species on SANBI Red list include:

- *Indigofera hybrida* - VU
- *Habenaria bicolor* - NT
- *Gladiolus robertsoniae* - NT
- *Kniphofia typhoides* - NT

Species on the GDARD list include:

- *Habenaria bicolor* - NT
- *Gladiolus robertsoniae* - NT

A total of 27 species of plants enjoy protection from the NTCO including all genera of orchids (*Orchidacea*), all true ferns (Class Polypodiopsida) and all species of *Gladioli,* in addition two (2) *Aloe* spp. are protected, two (2) *Kniphofia spp.,* and two of *Crinum spp.*

The NEMBA category 1b invasive plants species *Cuscuta campestris, Solanum sisymbriifolium* and *Kalanchoe tubiflora* are also known to be found within the QDS along with the category 1a invader species *Iris pseudacorus.* The CARA category 1 weeds namely *Cuscuta campestris*, and *Solanum sisymbriifolium*, along with the category 3 invader *Acacia baileyana*, and the category 2 weed *Acacia dealbata* are known to be found within the area.

Fauna Baseline: Twenty-six (26) mammal species were found to possibly occur within the QDS (ADU), most of which have a Least Concern status. Six (6) species are classified within the National Red Data List of which only two (2) species could possibly occur on-site. These two (2) species as marked above have a small probability to occur on-site, but not likely expected based on the locality on a busy intersection and degraded habitat.

According to data collected during the Southern African Bird Atlas Project 2 (SABAP2), 229 species have been recorded for the specific pentad (2605_2815) where the activities are proposed, and ten (10) species have been indicated to be red listed. Some of these species are also included in the GDARD Orange and Redlist.

Hundred and one (101) butterfly species (Appendix D) were found for the 2628AB, all of which are categorized as Least Concern by SANBI (South Africa Butterfly Conservation Assessment -SABCA 2013). Seven (7) Lacewing species, twenty-six (26) Odonata species and two (2) Scorpion species have been recorded within the area, but none of these species are known to have a red listed status.

Fourteen (14) reptile species were recorded for the QDS and are presented in Appendix D. No red listed species were recorded. The amphibian study conducted was mainly of a desktop nature, gathering information from the Frog Atlas of South Africa. Fourteen (14) species was listed within this QDS and one species were recorded to have a redlisted status, but it should be taken into account that the record holds the date of October 2000, which is 20 years ago.

Site Survey Results

Ridges 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. Many Red Data / threatened species of plants and animals inhabit ridges. Due to their threatened status, Red Data species require priority conservation efforts in order to ensure their future survival. As such, the conservation of ridges in Gauteng will contribute significantly to the future persistence of these species.

Slope on an east-to-west elevation average on 1.9 %, with a maximum slope of 3.2 % (Figure 7). Average slope is given as 0.7% within the North-to-South elevation profile of the development area. Maximum slope recorded is provided as 3.7 % (Figure 8). No ridges occur on-site or will be impacted within a 200m perimeter as the buffer as shown consists only of residential areas and no additional natural habitat (besides the dam and natural areas towards the south-east) needs to be surveyed based on this fact.

A site survey was done on the 10th of August 2020. The study area was investigated under the prevailing conditions at the time of the site survey and included late winter conditions. Signs of recent fire were visible across the site. Three broad units were identified and these are as follows:

- Vegetation Unit 1 (VU1): Degraded secondary grassland;
- Vegetation Unit 2 (VU2): Associated Wetland, hydrophytic/riparian vegetation;
- Unit 3 (U3): Mixed and transformed land use associated with the built environment

A total of fifty-five (55) floral species were found to occur within the site and have been divided between the representative units delineated below based on overall composition and distribution. The full list is provided in Appendix C.

Eighteen (18) of the floral species recorded during the site survey are of conservation concern (SCC). Some of these species are classified as invasive vegetation by NEM:BA and others are also classified as either a weed or an invader by CARA.

Thirteen (13) of the Alien and Invasive Plants (AIP) found on the study site are classified as Category 1b invasive plants. Category 1 is the strictest category of species and none of these species are allowed to occur and/or become established on any land area except for the use of a biological control reserve. They possess characteristics that are harmful to humans, animals or the environment. Category 1b is described in NEM:BA as invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove.

Three (3) species found during the field assessment, namely *Acacia decurrens* (Green Wattle), *Populus x canescens* (Grey poplar), and *Acacia dealbata* (Silver wattle) is a Category 2 plant species. Category 2 AIP are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.

Two (2) species found within the study area are classified as Category 3 invaders namely *Morus sp.* (Mullberry) and *Melia azedarach* (Syringa). Category 3 invaders are described NEMBA as invasive species that may not be propagated or grown in any way, conveying or moving or translocating of a specimen categorized as such, selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen, spreading or allowing the spread of any specimen of a listed invasive species, and introduction of a specimen of an alien or a listed invasive species to offshore islands.

Some of the species that were encountered during the field survey have cultural and/or medicinal use. Among the medicinal species, the AIP species *Eucalyptus camaldulensis* found on site may be used for traditional medicine, but this does not exclude them from being invasive and therefore should be treated accordingly.

A total of twelve (12) grass species were found during the field survey, eleven (11) of which can be used to assess the ecological grass status. None of the species found to occur are considered to be “Decreaser” species. Decreaser species are usually highly palatable climax grasses and are good indicators of the veld condition. These species are abundant in good veld, but they tend to decrease when the veld is overgrazed or undergrazed (Van Oudtshoorn, 2014). Most of the grasses are indicated as “Increaser II” species (nine (9) species). Increaser II species are abundant in overgrazed veld. These grasses increase as a result of the disturbing effect of overgrazing. It mostly includes pioneer and subclimax species such as *Eragrostis regidor* due to the fact that these grasses bare many seeds and easily multiply and establish themselves. Only three (3) of the species that occurred is classified as “Increaser I” species. Increaser I species tend to increase in underutilised veld and includes unpalatable climax/subclimax grasses such as *Trachypogon spicatus*.

From a faunal and habitat observation point of view, the area has been largely transformed and only typical urban avifaunal species were sighted during the field assessment. Smaller mammals were also observed (signs and dung), but the faunal community has been vastly impacted and the habitat support offered by this area is seen as very low. Several foot paths were observed during the field assessment based on the fact that humans will utlise the park to cross towards the other side of the road and also remaining fires of informal squatters have been observed. It was also evident that stray dogs currently utilise the area as a hunting ground and several were sighted raiding the wetland terrain during the field assessment. No red listed were sighted or thought to occur due to the degraded nature of the vegetation units and associated habitat.

The wetland and pan associated vegetation unit (VU2) had been rewarded with Medium sensitivity to cater for the sensitivity requirement as possible habitat for sensitive species. The dam within the buffer have been included as Medium Sensitivity, since it is within a residential area on private property and therefore not likely to sustain red listed species, but still constitute important habitat extension for VU2 (ecological corridor). The area is generally thought to be impacted and degraded (and therefore not awarded High sensitivity which is usually awarded to sensitive features such as wetlands and pans) and no signs of red listed species were found to occur.

The artificial channels leading from the road towards the south has been included in VU2 above, but have been separated in the sensitivity analysis and included within the Low sensitivity group below based on the fact that these sections, although sedges and rushes (hydrophytic vegetation) occur, are artificial in nature and filled with litter. These channels will

cease to exist once the stormwater features for this property has been formally designed. It is recommended that once formally designed, clean stormwater be diverted around the property still allowing it to reach the natural environment.

Impacts expected, Risk and Mitigation

Impacts for the development has been assessed and the risk rating has been determined as Medium or Medium-High (without mitigation) and only based on wetland terrain and other pan features found, however, adhering to mitigation measures, the risk will lower towards Medium-Low or Low.

Impacts assessed include amongst other:

- The site is largely degraded and habitat has been transformed, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The wetland associated areas will especially be negatively impacted if not managed well.
- Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas.
- Impacts on the wetland and water resources located downstream of the transformed wetland system. This may be due to pollutants entering the water resource, specifically petroleum related waste products which could possibly spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones.
- Impacts on the wetland and water resources located downstream during and after closure and demolition. However, since shopping centres do not usually have a closure phase, no impacts are predicted.

Mitigation and management measures are prescribed to ensure the least possible impact on the ecology of the area and should be strictly implemented. These include:

- Stilts and other features could be considered for the shopping centre and this will preserve the remaining functioning of the wetland unit where possible, since the wetland is no longer deemed functional and in good ecological health. However, a wetland delineation and specialist investigation should be conducted by a wetland specialist.
- Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary.
- Adhere to all management and mitigation measures as prescribed within the wetland specialist report.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Continuous rehabilitation of the area should occur, immediate closure and rehabilitation of any areas dug during the construction of the stilts and foundations. This will entail the spreading of topsoil, revegetation and management of invasive species.
- Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment, which should include oil traps.
- Implement an Alien and Invasive Management Programme, which will aim to remove and manage the plants recorded during the field survey, since most of these species are already listed on the Alien and Invasive Species list as published in 2016 (Department of Environmental Affairs, 2016).
- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora.
- If possible, find an alternative placement for features of the shopping centre as to prevent placement within a wetland or wetland soils.
- Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment.
- Continuous rehabilitation of the area should occur in accordance with the WUL or if an offset agreement is devised and approved, as well as monitoring as prescribed.

A formal terrestrial management plan has also been included within Section 10.

It's the reasoned opinion of the specialist that the development may continue if all mitigation measures are implemented and all areas of medium or high sensitivity are avoided where feasibly possible. Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as Medium sensitivity. The wetland buffers as delineated and recommended by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the

enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance.

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ABBREVIATIONS

AEWA	African-Eurasian Migratory Waterbird Agreement
AIP	Alien and Invasive Programme
ADU	Animal Demographic Unit
BGIS	Biodiversity Geographical Information System
BLSA	Bird Life South Africa
CITES	Convention on International Union for Conservation of Nature
DAFF	Department of Agriculture, Forestry and Fisheries (Now DEFF)
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DEFF	Department of Environmental Affairs, Forestry and Fisheries
ECO	Environmental Control Officer
GDARD	Gauteng Department of Agriculture and Rural Development
IAS	Invasive Alien Species
IUCN	International Union for Conservation of Nature
Ltd	Limited
MLRA	Marine Living Resources Act, 1998 (Act No. 18 of 1998)
NBA	National Biodiversity Assessment (NBA 2011)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEM:PA	National Environmental Management: Protected Areas Act 57 of 2003
NFA	National Forests Act, 1998 (Act No. 84 of 1998)
NPAES	National Protected Areas Expansion Strategy (NPAES 2008)
OCSLA	Office of the Chief State Law Advisor
POSA	Plants of South Africa
Pty	Proprietary
QDS	Quarter Degree Grid Cell
SABAP2	South African Bird Atlas Project 2
SANBI	South African Biodiversity Institute
SHEQ	Safety, Health, Environment and Quality Officer
ToPs	Threatened or Protected Species as published by the Minister
VM	Virtual Museum
VU	Vulnerable

INTRODUCTION AND SCOPE

1 INTRODUCTION

This document has been prepared and submitted by Enviridi Environmental Consultants (Pty) Ltd (EnviRidi) to the client: Index Integrated Rural and Urban Development Expertise (Pty) Ltd in response to a request for a biodiversity impact assessment as part of the Environmental Impact Assessment process and Water Use License application for the Brentwood Shopping Centre proposed in the Gauteng Province area.

2 SCOPE AND AIM OF THE STUDY

The aim of this study includes the following objectives:

- General description of the biodiversity components in the study area;
- Description and mapping of the broad vegetation units (if more than one) identified in the study area;
- Identify, evaluate and discuss any sensitive areas and species that should be avoided during the proposed activities;
- Utilise the South African Biodiversity Institute (SANBI) Database to obtain specialized information and previous surveys within the area to supplement the field survey and support findings;
- To determine and assess associated impacts and risks;
- Relevant mitigation measures and a management plan will be proposed to reduce severity of impacts to the flora and fauna in the region; and
- To provide recommendations that will support the proposed management actions.

The baseline desktop fauna biodiversity study included the following aspects:

- A desktop invertebrate and mammal study, which included determining the:
    - Endemic species; and
    - Red Data species (IUCN, SA Red Data Book & TOPs List).

- A field survey was conducted to determine the:
    - Likelihood of ecologically significant invertebrates and mammals occurring in the area based on status of the environment;
    - Presence of endemic species;
    - Presence of exotic and invasive species;
    - Presence of IUCN Red Data species; and
    - Presence of culturally significant species.

The information from both the desktop and field survey was used to report on the following:

- Describing the project area in terms of the most recent International, National and Regional biodiversity status for species;
- To determine and complete an impact assessment and risk evaluation;
- Mitigation measures and a management plan will be proposed to reduce severity of impacts to the flora and fauna in the region;
- To provide recommendations that will support the proposed management actions; and
- To provide an assessment of the result obtained.

3 METHODOLOGY AND APPROACH UTILISED

It is important to note that many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have previously been disturbed. Assessing the impacts of a proposed project often requires evaluating the conservation value of the site relative to other natural areas in the surrounding area.

A simple approach to evaluating the relative importance of a site and the species found within it includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?
- Is the site modified/disturbed in any way?

Thus, the general approach and angle adopted for this type of study is to identify any potential fauna species that may be affected by the proposed development. This means that the focus of this report will be on rare, threatened, protected and conservation-worthy species. The general approach adopted for this type of study is thus to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws.

Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which is most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National Legislation protecting environmental and biodiversity resources.

3.1 Literature review and desktop study

A desktop assessment was conducted to establish whether any potentially sensitive species/receptors might occur on site. The South African National Biodiversity Institute's online biodiversity tool, ADU (Animal Demography Unit) Virtual Museum was used to query a species list for the Quaternary Degree Square (QDS) within which the study area is situated. Information regarding species of conservation concern was obtained prior to the field investigation. This was conducted by researching all available information resources including, but not limited to, the following:

- International Union for Conservation of Nature (IUCN) Red List of Threatened Species;
- The Endangered Wildlife Trust's Red List of Mammals of South Africa, Lesotho and Swaziland; and
- NEMBA List of Threatened or Protected Species (TOPS List).

Note that all resources used has been listed in the reference section of this report.

To describe the overall site characteristics, and to identify points of interest within the site for evaluation, Google Earth Imagery and the 1:50 000 topographical maps were examined.

The importance of a desktop study is to provide a reference condition to determine the current state of the environment and to draw comparisons between the potential of the area and current degradation from surrounding land uses. Consequently, it was possible to identify potential areas of concern and to draw up a list of potential species that may be affected by the proposed development.

3.2 Field investigation

A field investigation was undertaken within late August 2020 to supplement and confirm several findings from the desktop study. This mainly served as a fatal flaw analyses to determine whether any major ecological concerns exist with regards to the study area surface infrastructure establishment.

During the field investigation the observed and derived presence of fauna associated with the recognised habitat types of the study site, were recorded. In addition, fauna was also identified by means of spoor, droppings, burrows, or shelters. No trapping or mist netting was conducted, as the scope of work did not require such intensive work.

3.3 Data analyses

Information obtained during the desktop assessment and the field survey were analysed and compared. Data interpretation and conclusions made were deduced from knowledge, and available literature and case studies. The habitat availability for sensitive fauna species which was assessed throughout the study area were furthermore included in the analysis as well as the potential impact of the development on sensitive fauna species.

Geospatial analysis in terms of sensitive areas and known species distribution were used in comparison with the data gathered to make certain deductions. This will also aid the planning and positioning of the infrastructure as well as

management for the various proposed development activities. Better protection will be awarded to sensitive areas that have unique species compositions or sensitive habitat types.

LEGISLATION RELATING TO ECOLOGY

4 SPECIFIC LEGISLATION REQUIREMENTS

4.1 Provincial Specifications: GDARD Minimum requirements

Wetlands, Rivers, Ridges, Caves and Corridors and other known sensitive areas were specifically searched for and certain species compositions or possible signs of occurrence on site.

The SA Red Data Book (Endangered Wildlife Fund) and the Threatened or Protected Species Regulations published initially in Government Gazette (23 February 2007), National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA), also known as the TOPS List, was used to determine the degree of protection designated within the Environmental Management Plan. The latest edition of the TOPS list is discussed in detail within this document. Please refer to Section 4.5 and Section 4.6. for a comparison between the 2013 and the latest 2015 version of the TOPS list.

Plants: All good condition natural vegetation and primary grassland (even if it is in a poor/degraded condition) must be mapped and designated as sensitive.

The entire area occupied by populations of Red List and Orange List plant species must be mapped and buffer zones provided to mitigate deleterious edge effects such as the effects of invasive plant and animal species, physical damage and soil compaction caused through trampling and harvesting, abiotic habitat alterations and pollution. Plant populations and protective buffer zones, beginning from the outer edge of the population, must be designated as sensitive.

Specific species searched for were during the field survey conducted:

- **Mammalia:** Rough-haired golden mole *(Chrysospalax villosus),* Spotted-necked otter *(Lutra maculicollis),* African marsh rat *(Dasymys incomtus)* (Riverine habitats).
- **Avifauna:** (Prioritised by Department of Agriculture and Rural Development):
  Cape Vulture, Blue Crane, Lesser Kestrel, African Grass-Owl, African Marsh-Harrier, White-backed Night-Heron, White-bellied Korhaan, Martial Eagle, African Finfoot, Lesser Flamingo, Secretarybird, Black Stork, Half-collared Kingfisher and Greater Flamingo. All rivers that provide suitable habitat for White-backed Night-Heron / African Finfoot / Half-collared Kingfisher (or where the presence of these species have been confirmed) should be specifically mentioned and mapped in terms of sensitivity guidelines.
- **Amphibia:** The Giant Bullfrog (*Pyxcicephalus adspersus*) has been removed as special priority following re-assessment of the species' status in South Africa. The species is not truly Near Threatened in South Africa (no quantitative analysis of the Giant Bullfrog distribution against the IUCN criteria can consider them as such). Given the current objectives of the C-plan i.e. to be used to protect representative habitat and generate specialist studies for threatened faunal species, the Giant Bullfrog does not qualify for inclusion as a species-specific layer requiring specialist assessments. As per the C-Plan approach, the conservation of the Giant Bullfrog and of amphibians in general will be met by the protected area network as well as the designation of priority habitats i.e., pans or quaternary catchments, with associated restrictions on land use.[1]

Ridges: Ridges are defined by the Gauteng Department of Agriculture and Rural Development (GDARD) in the document Department Policy Final Draft: Development Guidelines for ridges, Gauteng Department of Agriculture, Conservation and Environment (GDACE): “The term “ridge” refers loosely to hills, koppies, mountains, kloofs, gorges etc. and the essential characteristic defining these topographical features is the slope of the site, whereby any topographical feature in the landscape that is characterised by slopes of 5° or more (as determined by means of a GIS digital elevation model) is defined as a ridge” (GDACE, 2001).

The extent of development on ridges is also used by GDARD to determine the class of a ridge. The total area of ridge vs the area size of development is used:

Ridge Type	Classification criteria (percentage transformed)
Class 1	0-5%
Class 2	5-35%

[1] Extract taken from GDARD Minimum Requirements (Updated June 2012)

Class 3	35-65%
Class 4	65-100%

To ensure the conservation of the species, buffers are recommended around areas providing habitat to the threatened species. According to the GDARD minimum requirements for biodiversity assessments (2012), Class 1 ridges must be protected by a 200-meter buffer.

4.2 Gauteng Conservation Plan (Gauteng C-Plan V3.3)

Forty-five threatened plants species, derived from Gauteng's 2009 red and orange listed plants, were prioritized according to a ranking scheme (GDARD, 2014).

1. Endemism to South Africa (Criteria A): A1 species being SA endemics and A2 species being found over a broader area.
2. Localized distributions (Criteria B): B1 species are found only in Gauteng, B2 species in Gauteng and one other province/country, and B3 species in Gauteng and two provinces or countries.

Table 1: Red and Orange Listed Plants in Gauteng

Species	Priority Grouping	Conservation Status (1 global status; 2 national status)	Confirmed habitat with 100% targets (ha)	Number of distinct populations & targets set for these distinct populations	
Total number of distinct populations			**Target number of distinct populations**		
1. Adromischus umbraticola subsp. *umbraticola*	A2	Near Threatened[1]	408	31	9
2. Alepidea attenuata	B	Near Threatened[2]		18	1
3. Aloe peglerae	A2	Endangered[1]	2918		
4. Argyrolobium campicola	A3	Near Threatened[1]		7	2
5. Argyrolobium megarrhizum	A3	Near Threatened[1]		15	3
6. Blepharis uniflora	A2	Rare[1]		11	1
7. Bowiea volubilis subsp. *volubilis*	B	Vulnerable[2]	4 180		
8. Brachycorythis conica subsp. *transvaalensis*	A3	Vulnerable[1]	187	57	15
9. Brachystelma discoideum	B	Endangered[2]		13	3
10. Ceropegia decidua subsp. *pretoriensis*	A1	Vulnerable[1]	868	75	36
11. Ceropegia turricula	A3	Near Threatened[1]		25	5
12. Cheilanthes deltoidea subsp. *nov. Gauteng form*	A2	Vulnerable[1]	287	116	17
13. Cineraria austrotransvaalensis	A3	Near Threatened[1]	24	95	29
14. Cineraria longipes	A1	Vulnerable[1]	2 446	117	39
15. Cleome conrathii	A3	Near Threatened[1]	296		
16. Cucumis humifructus	B	Vulnerable[2]		13	3
17. Delosperma gautengense	A1	Vulnerable[1]	153		
18. Delosperma leendertziae	A2	Near Threatened[1]	1 453	4	1
19. Delosperma macellum	A2	Endangered[1]	92		
20. Delosperma purpureum	A1	Endangered[1]	70		
21. Dioscorea sylvatica	B	Vulnerable[2]		63	1
22. Encephalartos lanatus	A2	Vulnerable[1]	412	13	3
23. Encephalartos middelburgensis	A2	Critically Endangered[1]	1 960		
24. Eulophia coddii	A2	Vulnerable[1]		72	24
25. Frithia humilis	A2	Vulnerable[1]	573	8	3
26. Frithia pulchra	A2	Rare[1]	97		
27. Gladiolus pole-evansii	A2	Rare-sparse[1]		17	1
28. Gladiolus robertsoniae	A3	Near Threatened[1]	63	12	3
29. Gnaphalium nelsonii	A2	Rare-sparse[1]		33	8
30. Habenaria barbertoni	A2	Near Threatened[1]	83	55	15
31. Habenaria bicolor	B	Near Threatened[2]		100	27

32. Habenaria kraenzliniana	A3	Near Threatened[1]	78	161	44
33. Habenaria mossii	A1	Endangered[1]	553	57	17
34. Holothrix micrantha	A1	Endangered[1]		24	11
35. Holothrix randii	B	Near Threatened[2]	474	126	35
36. Khadia beswickii	A1	Vulnerable[1]	1 759	8	2
37. Kniphofia typhoides	A3	Near Threatened[1]	779	39	1
38. Lithops lesliei subsp. *lesliei*	B	Near Threatened[2]	1 629		
39. Lithops lesliei subsp. *lesliei var. rubrobrunnea*	A1	Endangered[1]	258	1	1
40. Melolobium subspicatum	A1	Vulnerable[1]	1 748	5	2
41. Nerine gracilis	A3	Near Threatened[1]	277		
42. Prunus africana	B	Vulnerable[2]		11	3
43. Searsia gracillima var. *gracillima*	A1	Near Threatened[1]	126	22	8
44. Stenostelma umbelluliferum	A3	Near Threatened[1]	169	89	19
45. Trachyandra erythrorrhiza	A3	Near Threatened[1]	1 056	134	35

The Brentwood site has been flagged for a possible occurrence of Orange listed plant habitat. Animal species have also been incorporated into the Orange and Redlists published, however, none of these have been included for the specific site associated with the GDARD C-Plan (Version 3.3) and therefore also not provided here.

4.3 Transvaal Nature Conservation Ordinance

The Transvaal Nature Conservation Ordinance (Gauteng Provincial Administration, 1983) has not been repealed and the following sections are of interest:

- Schedule 2: Protected game
- Schedule 2A: Specially protected game
- Schedule 3: Ordinary game
- Schedule 4: Protected wild animals
- Schedule 5: Wild animals
- Schedule 6: Exotic animals
- Schedule 7: Invertebrata
- Schedule 8: Problem animals
- Schedule 9: Troutwaters
- Schedule 10: Prohibited aquatic growths
- Schedule 11: Protected plants
- Schedule 12: Specially protected plants

4.4 Gauteng Nature Conservation Bill, 2014

This Bill aims to provide for the sustainable utilization and protection of biodiversity within Gauteng; to provide for the protection of wild and the management of alien animals; protected plants; aquatic biota and aquatic systems; to provide for the protection of invertebrates and the management of alien invertebrates; to provide for professional hunters, hunting outfitters and trainers; to provide for the preservation of caves, cave formations, cave biota and karst systems; to provide for the establishment of zoos; to provide for the powers and establishment of Nature Conservators as well as to provide for administrative matters and general powers.

4.5 National Environmental Management Act, 2004 (Act No. 10 of 2004)

4.5.1 Notice 389 of 2013 (NEM:BA)

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) has a yearly update and publication of lists of species that are threatened of protected and activities that are prohibited and exemption from restriction. The latest update is Government Gazette Notice 389 of 2013, published on the 16 April 2013. An amendment of this has been published in 2015 for public comment as well.

The status provided by the Government Gazette in terms of Notice 389 implies:

- Critically endangered: Section 56(1)(a) applies to the species awarded this status in terms of NEM:BA[2], meaning: *"Critically endangered species, being any indigenous species facing an extremely high risk of extinction in the wild in the immediate future".*
- Endangered species: Section 56(1)(b) applies to the species awarded this status in terms of NEM:BA, meaning: *"Endangered species, being any indigenous species facing a high risk of extinction in the wild in the near future, although they are not a critically endangered species".*
- Vulnerable species: Section 56(1)(c) applies to the species awarded this status in terms of NEM:BA, meaning: *"Vulnerable species, being any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future, although they are not a critically endangered species or an endangered species".*
- Protected species: Section 56(1)(d) applies to the species awarded this status in terms of NEM:BA, meaning: *"Protected species, being any species, which are of such high conservation value or national importance that they require national protection, although they are not listed in terms of paragraph (a), (b) or (c)".*

All listed animals in terms of the Act need special permits to be handled, kept, breeding or any other form of propagating, trade and relocation/moving. Any action intended in terms of potential harm, hunting, destruction/killing or international trade are in most cases prohibited.

4.6 Government Gazette Notice No. 599 of 2014 – Alien and Invasive Species

The Department of Environmental Affairs (DEA) manages Invasive Alien Species (IAS) under the NEM:BA.

The four different categories that NEM:BA classify Alien Invasive Species under are:

- Category 1a: Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. These species need to be controlled on your property, and officials from the Department of Environmental Affairs must be allowed access to monitor or assist with control.
- Category 1b: Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove. All category 1b species must be contained, and in many cases, they already fall under a government sponsored management programme.
- Category 2: These are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.
- Category 3: These are invasive species that can remain in your garden. However, you cannot propagate or sell these species and must control them in your garden. In riparian zones or wetlands all category 3 plants become category 1b plants.

[2] National Environmental Management: Biodiversity Act, 1998 (Act 10 of 1998)

4.7 The National Forests Act, 1998 (Act No. 84 of 1998) (NFA)

The NFA:

- Promotes the sustainable management and development of forests for the benefit of all;
- Creates the conditions necessary to restructure forestry in State Forests;
- Provide special measures for the protection of certain forests and protected trees;
- Promotes the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes.
- Promotes community forestry.

In terms of the NFA, forest trees or protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by the Department of Agriculture, Forestry and Fisheries (DAFF – now DEFF).

4.8 National List of Threatened Terrestrial Ecosystems (2011)

NEM:BA provides for listing of threatened or protected ecosystems, in one of four categories:

- Critically Endangered;
- Endangered;
- Vulnerable; or
- Protected.

Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value (SANBI, BGIS).

4.9 National Protected Areas Expansion Strategy (NPAES 2008)

The National Protected Area Expansion Strategy was approved for implementation in March 2009. The NPAES was commissioned by the Department of Environmental Affairs and Tourism (DEAT), now known as the Department of Environment Affairs (DEA), with technical support from the South African National Biodiversity Institute (SANBI) and South African National Parks (SANParks).

The NPAES provides a common set of targets and spatial priorities to guide efforts and enable co-ordination among the many role players involved in protected area expansion. This is particularly important in the context of South Africa's globally exceptional biodiversity richness on the one hand, and significant financial and human resource constraints on the other.

A revision to the strategy has occurred in 2016, but implementation has not been verified.

4.10 National Biodiversity Assessment (NBA 2011)

The National Biodiversity Assessment (2011) provides an assessment of South Africa's biodiversity and ecosystems, including headline indicators and national maps for the terrestrial, freshwater, estuarine and marine environments. The NBA (2011) was led by SANBI in partnership with a range of organisations. It follows on from the National Spatial Biodiversity Assessment (2004), broadening the scope of the assessment to include key thematic issues as well as a spatial assessment. The NBA (2011) includes a summary of spatial biodiversity priority areas that have been identified through systematic biodiversity plans at national, provincial and local levels (SANBI, BGIS).

4.11 National Biodiversity Assessment (NBA; 2018)

The NBA 2018 is the third such assessment for South Africa – following the National Spatial Biodiversity Assessment 2004 and the National Biodiversity Assessment 2011. The NBA 2018's goals of improving ecosystem classification and mapping, introducing a species protection level indicator and potential genetic diversity indicators, and including South Africa's sub-Antarctic territory for the first time were all met. In addition, this NBA trialled the new IUCN Red List of Ecosystem criteria and was able to track trends in species status and habitat loss for the first time. The NBA 2018 has involved nearly five years' groundbreaking work from 2015 to 2019. The National Biodiversity Assessment (NBA) is the

primary tool for monitoring and reporting on the state of biodiversity in South Africa. It is used to inform policies, strategies and actions in a range of sectors for managing and conserving biodiversity more effectively.

Each NBA is named after the year of the data underpinning the assessment. The third NBA, NBA 2018, was released in October 2019.

The South African Protected Areas Database (SAPAD), maintained by Department of Environment, Forestry and Fisheries (DEFF) and released quarterly, formed the core of the protected area dataset used in this NBA. The database required various restructuring steps for use in the protection level analysis. Overlaps were resolved and inconsistencies between conservation agency data and SAPAD were investigated and resolved. The strength of this dataset is that it includes designation dates and allows for time-series protection analysis; while a limitation of the dataset is that many of the privately owned nature reserves declared prior to publication of the Biodiversity Act have yet to be validated.

4.12 NEMA, GN No. 648 of 10 May 2019 and GGN No. 9 of 10 January 2020

Government Notice 648 first described the intention to publish procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of section 24(5)(a) and (h) of the National Environmental Management Act, 1998, when applying for Environmental authorisation and the Minister again gave notice of her intention to prescribe protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring environmental authorisation on the 10th of January 2020. In February 2020, the commenting period had been extended to 24 March 2020.

These regulations have not been in effect during the compilation of this report, but is expected to be formalised and promulgated late 2020/beginning 2021.

4.13 Content of Specialist Reports

Government Notice R982 as published in Government Gazette 38282 dated 4 December 2014 and as amended by Government Notice 326 in Government Gazette 40772 dated 7 April 2017, outlines in Appendix 6 the requirements for specialist reports. The table below provides an overview of the requirements and the applicable sections of this report.

Table 4-2: Legislative report requirements GNR982

GNR982 as amended by GN326	Report Section
(1) A specialist report prepared in terms of these Regulations must contain—	
(a) details of—	
(i) the specialist who prepared the report; and	Page i
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix E
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page ii
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2, Section 6
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9.2.1.3, Section 9.2.1
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternative;	Section 8
(g) an identification of any areas to be avoided, including buffers;	Section 8
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 8
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	First Section of report (Page i)
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 9, Section 9.2.1
(k) any mitigation measures for inclusion in the EMPr;	Section 10
(l) any conditions for inclusion in the environmental authorisation;	Section 10
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10

GNR982 as amended by GN326	Report Section
(n) a reasoned opinion—	Section 11 and Page x
(i) whether the proposed activity, activities or portions thereof should be authorised;	Section 11
(iA) regarding the acceptability of the proposed activity or activities; and	Section 11 and Page x
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8, Section 11 and Page x
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
(q) any other information requested by the competent authority.	Not applicable
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Not applicable

On 20 March 2020 "*Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the NEMA when applying for environmental authorization*" was published in GN 320 (Government Gazette 43110). One of the themes identified and covered by this protocol areTerrestrail Biodiversity.

It is important to note that the protocol replaces the requirements of Appendix 6 of the EIA Impact regulations as outlined above. The protocol as published are outlined below. The following baseline descriptions must be included in the report.

Table 4-3: Content of specialist report GN320

Requirement	Section
1. General Information 1.1 An applicant, intending to undertake an activity as identified in the scope of this protocol on a site identified as being of "very high", "high" or "medium" sensitivity for terrestrial animal species on the national web based environmental screening tool must submit a Terrestrial Animal Species Impact Assessment Report.	This Report
1.2 However, where the information gathered from the initial site sensitivity verification identified in section 2 of this protocol or the specialist assessment differs from the designation of "very high", "high", or "medium" terrestrial animal species sensitivity from the national web based environmental screening tool and it is found to be of a "low" sensitivity, then a Terrestrial Animal Species Impact Assessment is not required.	A Specialist Report was required
1.3 Should paragraph 1.2 apply, a Terrestrial Animal Species Compliance Statement must be submitted. An environmental assessment practitioner or a suitably qualified taxon relevant specialist, registered with the South African National Council for Natural Scientific Professionals (SACNASP), must append to the Terrestrial Animal Species Compliance Statement a motivation and evidence (e.g. photographs) of the different terrestrial animal species sensitivity.	Appendices
2. Terrestrial Animal Species Impact Assessment 2.1 The assessment must be undertaken by a suitably qualified taxon relevant SACNASP registered specialist aligned with the taxa identified in the report generated from the national web based environmental screening tool on the site being submitted as the preferred development site.	Screening Tool report will be submitted by EAP
2.2 The Terrestrial Animal Species Impact Assessment must include the results of a site assessment undertaken on the preferred development site.	Section 7
2.3 The Terrestrial Animal Species Impact Assessment must be undertaken in accordance with the *Species Environmental Assessment Best Practice Guidelines 3* and must identify the following: 2.3.1 The species of conservation concern which were found on site;	Section 6 (Desktop), Section 7 (field Assessment)
2.3.2 The distribution, location, viability (ability to survive and reproduce in future) and detailed description of population size of the species of conservation concern identified on the preferred development site;	Section 7.2, 7.3, Section 7
2.3.3 The nature and the extent of the potential impact of the proposed development on the species of conservation concern on the proposed development site;	Section 9.2
2.3.4 The importance of the conservation of the population of the species of special concern identified on the proposed development site based on information available in national and international databases including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;	Section 6 (Desktop), Section 7 (field Assessment). All species have been awarded the SCC within the tables presented.
2.3.5 The potential impact of the proposed development on the habitat of the species of	Section 9.2, Section

Requirement	Section
conservation concern;	7.3.1.1
2.3.6 Any dynamic ecological processes occurring within the site and its surrounds that might be disrupted by the proposed development and resulting impact on the identified species of conservation concern; for example, fires in fire-prone systems;	N/A
2.3.7 Any potential impact of ecological connectivity (on site, and in relation to the broader landscape) and resulting impact on the identified species of conservation concern;	Section 8
2.3.8 Buffer distances as per the *Species Environmental Assessment Best Practice Guidelines* used for the population of each species of conservation concern;	Section 8
2.3.9 The likelihood of other threatened species, undescribed species or highly localised endemics, migratory species, or species of conservation concern, occurring in the vicinity; and	Section 8. No red listed species have been found to occur. Endemic species have been listed as mentioned within Section 7.2, Section 7.2.4 and Section 7.2.6 on an ad hoc basis
2.3.10 Identify any alternative development footprints within the preferred development site which would be of "low" sensitivity as identified by the national web based environmental screening tool and verified through the initial site sensitivity verification.	Section 8
3. The findings of the Terrestrial Animal Species Impact Assessment must be written up in a Terrestrial Animal Species Impact Assessment Report.	This Report
This report must include as a minimum the following information: 3.1 Contact details and curriculum vitae of the specialist including SACNASP registration number and fields of expertise;	Page i and Appendix E
3.2 A signed statement of independence by the specialist;	Page ii
3.3 Duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
3.4 A description of the methodology used to undertake the impact assessment and site inspection, including equipment and modelling used where relevant;	Section 3
3.5 A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Page ii
3.6 Areas not suitable for development, to be avoided during construction and operation where relevant;	Section 8 Medium-High Sensitivity areas should ideally be avoided
3.7 Additional environmental impacts expected from the proposed development based on those already evident on the site and a discussion on the cumulative impacts; and	Section 9.2.1.3
3.8 Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 10
3.9 A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not, and any conditions to which the opinion is subjected;	Section 11and Page x
3.10. A motivation must be provided if there were development footprints identified as per paragraph 2.3.10 above that were identified as having a "low" terrestrial animal species sensitivity and were not considered appropriate.	N/A
4. The findings of the Terrestrial Animal Impact Assessment must be incorporated into the Basic Assessment Report (BAR) or the Environmental Impact Assessment Report (EIAR), including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr. A signed copy of the assessment must be appended to the BAR or EIAR.	N/A – Done by EAP

PROJECT AND STUDY AREA CHARACTERISTICS

5 OVERVIEW OF STUDY AREA

5.1 Locality of Proposed Activities

The project area is located in the Gauteng Province near Brentwood on the corner of the Great North Rd/R23 and Celia Nestadt Road within the Ekurhuleni Metropolitan and District Municipality. The project is located just north west of Northmead and Farrarmere.

Figure 1: Brentwood Shopping Centre Locality

5.2 Activity Description

According to the information provided, the applicant intends to develop a shopping centre consisting of parking, shopping and retail areas, medical suites and drive thru areas.

5.3 Broad Vegetation Description (Vegetation Map 2018)

The project area is located in the Gauteng Province within the Soweto Highveld Grassland, within the Grassland Biome. The Soweto Highveld Grassland has a status of Vulnerable in terms of the NBA 2018. However, from the aerial footage it is visible that most of the footprint have been disturbed likely based on the fact that the footprint is on the corner of a busy intersection just east of Johannesburg near Benoni.

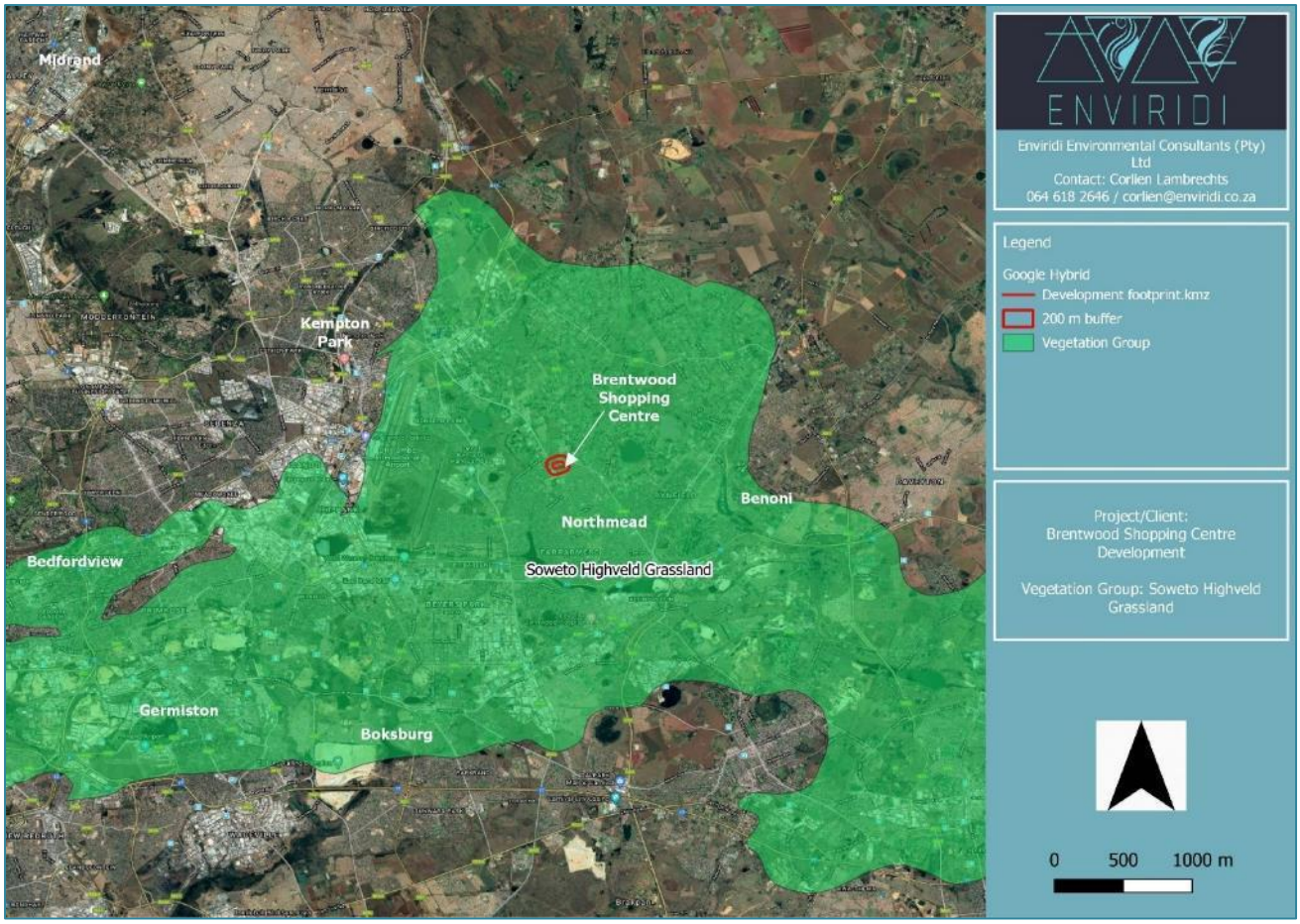


Figure 2: Vegetation Group for the Brentwood Shopping Centre

5.3.1 Soweto Highveld Grassland (GM 8)

It occurs on gently to moderately undulating landscape on the Highveld plateau, supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover. Only a handful of patches statutorily conserved or privately conserved and almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Dams have flooded some areas (Mucina & Rutherford, 2006).

Important taxa:

- Graminoids: *Andropogon appendiculatus* (d), *Brachiaria serrata* (d), *Cymbopogon pospischillii* (d), *Cynodon dactylon* (d), *Elionurus muticus* (d), *Eragrostis capensis* (d), *E. chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. planiculmis* (d), *E. racemosa* (d), *Heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Setaria nigrirostris* (d), *S. sphacelata* (d), *Themeda triandra* (d), *Tristachya leucothrix* (d), *Andropogon schirensis*, *Aristida adscensionis*, *A. bipartita*, *A. congesta*, *A. junciformis* subsp. *galpinii*, *Cymbopogon caesius*, *Digitaria diagonalis*, *Diheteropogon amplectens*, *Eragrostis micrantha*, *E. superba*, *Harpochloa falx*, *Microchloa caffra*, *Paspalum dilatatum*;
- herbs: *Hermannia depressa* (d), *Acalypha angustata*, *Berkheya setifera*, *Dicoma anomala*, *Euryops gilfillanii*, *Geigeria aspera* var. *aspera*, *Graderia subintergra*, *Haplocarpha scaposa*, *Helichrysum miconiifolium*, *H. nudifolium* var. *nudifolium*, *H. rugulosum*, *Hibuscus pusillus*, *Justicia anagalloides*, *Lippia scaberrima*, *Rhynchosia effusa*, *Schistostephium crataegifolium*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata*;
- geophytic herbs: *Haemanthus humillis* subsp. *hirsutus*, *H. montanus*;
- herbaceous climber: *Rhynchosia totta*;
- low shrubs: *Anthospermum hispidulum*, *A. rigidum* subsp. *pumilum*, *Berkheya annectens*, *Felicia muricata*, *Ziziphus zeyheriana*.

METHODOLOGY, DATA GATHERED AND ANALYSIS

6 DESKTOP ASSESSMENT

6.1 Site Characteristics and Status

From the aerial footage, the site falls on an intersection, but seem to be characterised by areas consisting of grassland and wetland in various degrees of disturbance.

Figure 3: Aerial footage of the site characteristics

From the Gauteng Environmental Management Zones (and BGIS), the site falls within Zone 2.

Zone 2: High control zone (within the urban development zone) – *Intention specified as:* This zone is sensitive to development activities. Only conservation should be allowed in this zone. Related tourism and recreation activities must be accommodated in areas surrounding this zone.

The site has not been included in either Zone 1 or Zone 5 (Figure 4), which has the following definitions (GNR No. 164 of 2 March 2018):

- **"Zone 1"** means the geographical area depicted as the Urban Development Zone in the Gauteng Provincial Environmental Management Framework in which infill, densification and concentration of urban development is facilitated.
- **"Zone 5"** means the geographical area depicted as the *Industrial and Commercial Focus* Zone in the Gauteng Provincial Environmental Management Framework In which non-polluting indusial md largescale commercial developments are facilitated through the use of excluded activities.

Figure 4: Gauteng Province Environmental Management Framework (GPEMF 2018)

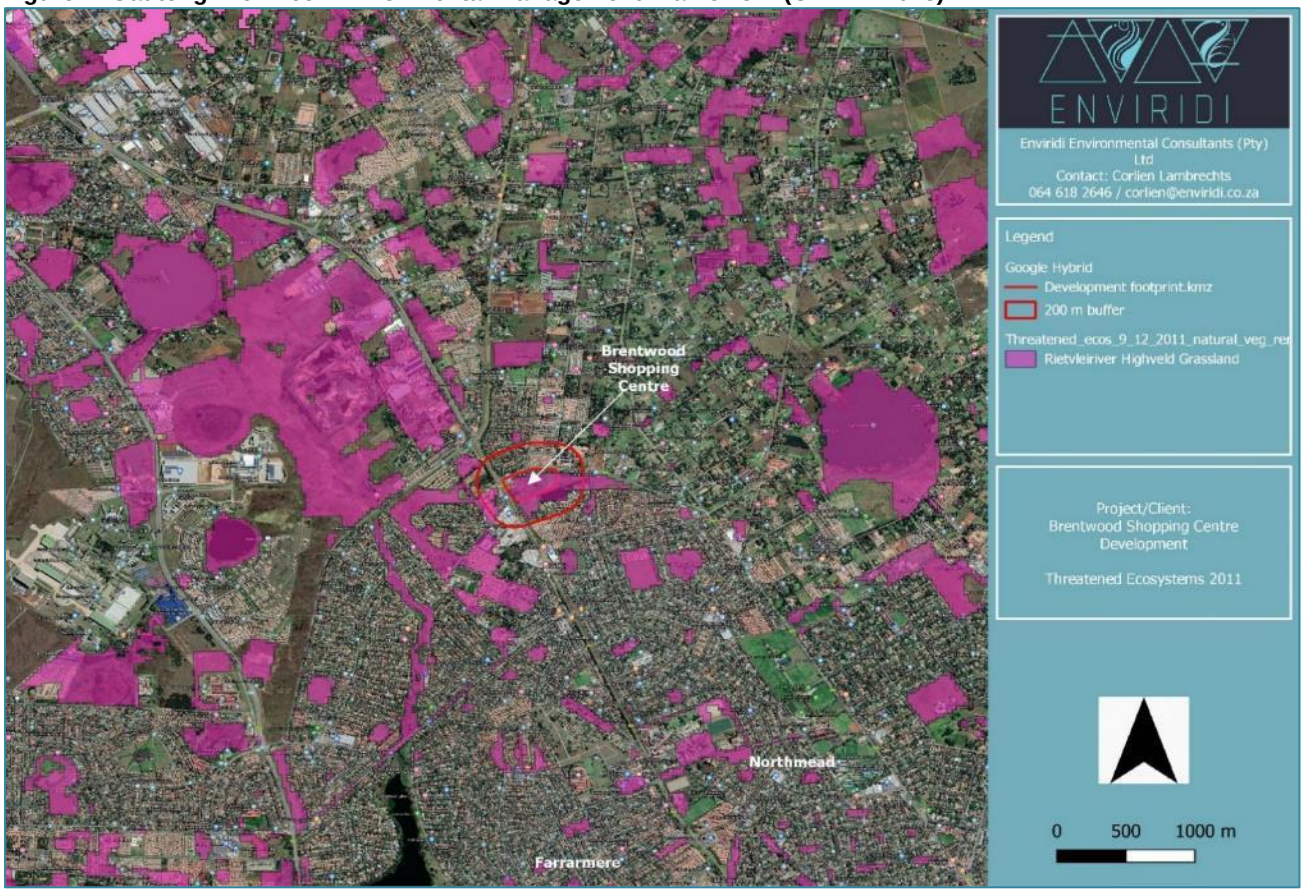


Figure 5: Brentwood Shopping Centre (including 200m buffer) showing Threatened Ecosystems 2011 – Rietvleiriver Highveld Grassland

Within the National Threatened Ecosystems (2011), sections of the site falls within Rietvleiriver Highveld Grassland (GP 7), which has a status of Critically Endangered (CR). This is in contrast with the NBA 2018, indicating the site falls within Soweto Highveld Grassland (as mentioned above, refer to Figure 2), which has a status of Vulnerable (VU).

Figure 6: Gauteng Conservation Plan (Terrestrial Biodiversity Assessment)

The Gauteng C-Plan v3.3 is based on the systematic conservation planning approach (GDARD, 2014).

The site is characterised in terms of the Gauteng Conservation Plan (Version 3.3) as a Critical Biodiversity Area (CBA – Important Area), with the surrounding area as Ecological Support Area (ESA). This seems to be based on the fact that some natural vegetation still exists within this zone and associated with wetland terrain and freshwater found just to the south east of the site (within the 200 m buffer).

Critical Biodiversity Areas (CBAs) can be defined as follows:
CBAs include natural or near-natural terrestrial and aquatic features that were selected based on an area's biodiversity characteristics, spatial configuration and requirement for meeting both biodiversity pattern and ecological process targets. CBAs include irreplaceable sites where no other options exist for meeting targets for biodiversity features, as well as best-design sites which represent an efficient configuration of sites to meet targets in an ecologically sustainable way that is least conflicting with other land uses and activities. These areas need be maintained in the appropriate condition for their category. Some CBAs are degraded or irreversibly modified but are still required for achieving specific targets, such as cultivated lands for threatened species.

From the data gathered, the site was delineated as possible habitat for Orange listed (OL) plant species and for consisting of natural vegetation.

6.2 Flora Assessment and Species lists compiled

The farm falls within the 2628AB Quarter Degree Square. Information on plant species recorded for the Quarter Degree Squares (QDS) was extracted from the POSA online database hosted by SANBI. A list of plant species that have a high probability of occurring in the 2628AB QDS is provided in Appendix B: POSA FLORA SPECIES LIST FOR 2628AB QDS.

Approximately 444 plant species occur as recorded for the 2628AB QDS, which consists of 75 families, with the most prominent families recorded from Asteraceae (62 species), Poaceae (58 species), Fabaceae (44 species), Cyperaceae (32 species), Hyacinthaceae (18 species). Thirty-five (35) exotic species and Twenty-six (26) endemic species are known to occur within the larger area Table 4.

Table 4: Floral species summary for QDS

Number of Families	Number of species	Endemic	Exotic/naturalised species
75	444	26	35

Almost all of these species are classified with a “Least Concern” (LC) IUCN status (Appendix A) and is therefore considered at a low risk of extinction and includes widespread and abundant species. However, some species were not classified as LC and could possibly occur within the study area. Species of conservation concern which occur in the 2628AB QDS are listed in Table 5.

Main findings in terms of Legislation (ToPS Listings, Protected Trees and IUCN):

- *Pelargonium sidoides* - Protected
- *Indigofera hybrida* - VU
- *Habenaria bicolor* - NT
- *Gladiolus robertsoniae* - NT
- *Kniphofia typhoides* - NT

Species on SANBI Red list include:

- *Indigofera hybrida* - VU
- *Habenaria bicolor* - NT
- *Gladiolus robertsoniae* - NT
- *Kniphofia typhoides* - NT

Species on the GDARD list include:

- *Habenaria bicolor* - NT
- *Gladiolus robertsoniae* - NT

A total of 27 species of plants enjoy protection from the NTCO including all genera of orchids (*Orchidacea*), all true ferns (Class Polypodiopsida) and all species of *Gladioli,* in addition two (2) *Aloe* spp. are protected, two (2) *Kniphofia spp.,* and two of *Crinum spp.*

The NEMBA category 1b invasive plants species *Cuscuta campestris, Solanum sisymbriifolium* and *Kalanchoe tubiflora* are also known to be found within the QDS along with the Category 1a invader species *Iris pseudacorus.*

The CARA category 1 weeds namely *Cuscuta campestris*, and *Solanum sisymbriifolium*, along with the category 3 invader *Acacia baileyana*, and the category 2 weed *Acacia dealbata* are known to be found within the area.

Table 5: Floral species of conservational concern within the QDS

Scientific Name	ToPS 2013	PT[3] 2016	NEM:BA Invader	IUCN	SANBI	NTCO	GDARD	CARA
Cyrtanthus breviflorus						Protected		
Crinum graminicola						Protected		
Crinum bulbispermum						Protected		
Kniphofia typhoides				NT	NT	Protected		
Kniphofia porphyrantha						Protected		
Aloe jeppeae						Protected		
Aloe subspicata						Protected		
Asplenium adiantum-nigrum						Protected		
Eucomis autumnalis var. *clavata*						Protected		
Babiana bainesii						Protected		
Gladiolus dalenii var. *dalenii*						Protected		
Gladiolus crassifolius						Protected		
Gladiolus robertsoniae				NT	NT	Protected	NT 1	
Gladiolus permeabilis var. *edulis*						Protected		
Habenaria epipactidea						Protected		
Habenaria dregeana						Protected		
Habenaria falcicornis var. *caffra*						Protected		
Habenaria bicolor				NT	NT	Protected	NT 1	
Orthochilus leontoglossus						Protected		
Eulophia cooperi						Protected		
Eulophia ovalis var. *ovalis*						Protected		
Eulophia hians var *nutans*						Protected		
Eulophia hians var. *hians*						Protected		
Cheilanthes hirta var *hirta*						Protected		
Cheilanthes viridis var. *glauca*						Protected		
Cheilanthes hirta var *brevipilosa*						Protected		
Pellaea calomelanos						Protected		
Cuscuta campestris			1b					1 Weed
Kalanchoe tubiflora			1b					
Acacia baileyana			3					3 Invader
Acacia dealbata			2					2 Weed
Iris pseudacorus			1a					
Solanum sisymbriifolium			1b					1 Weed
Pelargonium sidoides	Protected							
Indigofera hybrida				VU	VU			

[3] List of Protected Trees (2016)

6.3 Fauna Assessment and Species lists compiled

A baseline assessment was conducted to establish whether any potentially sensitive species might occur on site. The Virtual Museum and Animal Demography Unit (ADU) was used to compile species lists based on the sightings and data gathering from the South African Biodiversity Institute.

The importance of a baseline study is to provide a reference condition to determine the current state of the environment and to draw comparisons between the potential of the area and current degradation from surrounding land uses. This will be compared in terms of the future changes due to the proposed development by the client.

Aerial photographs and satellite imagery were used to delineate potential sensitive areas and wetland areas to guide the sampling during the field visit. During the field assessment, sensitive species were determined according to their close relationship and dependence on the vegetation type and the possible wetlands.

6.3.1.1 Mammals

Twenty-six (26) mammal species were found to possibly occur within the QDS, most of which have a Least Concern status. Six (6) species are classified within the National Red Data List of which only two (2) species could possibly occur on-site:

Table 6: Red listed Mammals

Family	Scientific name	Common name	Red list category
Bovidae	*Ourebia ourebi*	Oribi	Endangered *– Not expected to occur*
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016) – *Not expected to occur*
Muridae	*Otomys auratus*	Southern African Vlei Rat	Near Threatened (2016)
Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened (2016) – *Not expected to occur*
Nesomyidae	*Mystromys albicaudatus*	African White-tailed Rat	Vulnerable (2016)
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened (2016)

The two (2) species as marked above have a small probability to occur on-site, but not likely expected based on the locality on a busy intersection and degraded habitat.

6.3.1.2 Avifaunal

According to data collected during the Southern African Bird Atlas Project 2 (SABAP2), 229 species have been recorded for the specific pentad (2605_2815) where the activities are proposed, and ten (10) species have been indicated to be red listed. Some of these species are also included in the GDARD Orange and Redlist:

- Grass-owl, African - *Tyto capensis*;
- Kingfisher, Half-collared - *Alcedo semitorquata;*
- Secretarybird - *Sagittarius serpentarius* (Originally deemed Near Threatened, 2014)

The updated/latest known status in accordance with the SABAP2 and BLSA (2018/2019) data have all been provided within Table 7 below. The following Avifaunal species found in the region are considered Red listed as referenced in the various databases utilized and these include:

Table 7: Red listed Avifauna

Common Name	Scientific Name	Regional	Global
		BLSA 2018, 2019	
Curlew, Eurasian	*Numenius arquata*	NT	NT
Duck, Maccoa	*Oxyura maccoa*	NT	VU
Flamingo, Greater	*Phoenicopterus ruber*	NT	LC
Flamingo, Lesser	*Phoenicopterus minor*	NT	NT
Grass-owl, African	*Tyto capensis*	VU	LC

Kingfisher, Half-collared	*Alcedo semitorquata*	NT	LC
Rock-thrush, Sentinel	*Monticola explorator*	LC	NT
Secretarybird, Secretarybird	*Sagittarius serpentarius*	VU	VU
Stork, Abdim's	*Ciconia abdimii*	NT	LC
Stork, Yellow-billed	*Mycteria ibis*	EN	LC

Birds that use wetlands for breeding depend on the physical and biological attributes of the wetland. Birds have daily and seasonal dependencies on wetlands for food and other life-support systems. They are all dependent on a specific plant community to either construct their nests or as food and preferred habitat. Migratory birds will also be harshly affected if the wetland areas are impacted and destroyed during their absence.

From the Geospatial analysis and field assessment, several wetlands/surface water features are shown to occur within the applicable area. However, these areas have been impacted to a large extent and it is not likely expected that the site still represent habitat for any red listed bird species.

6.3.1.3 Butterflies

Hundred and one (101) butterfly species (Appendix D) were found for the 2628AB, all of which are categorized as Least Concern by SANBI (South Africa Butterfly Conservation Assessment -SABCA 2013).

6.3.1.4 Other Invertebrates

Seven (7) Lacewing species, twenty-six (26) Odonata species and two (2) Scorpion species have been recorded within the area, but none of these species are known to have a red listed status.

6.3.1.5 Reptiles

Fourteen (14) reptile species were recorded for the QDS and are presented in Appendix D. No red listed species were recorded.

6.3.1.6 Amphibians

The amphibian study conducted was mainly of a desktop nature, gathering information from the Frog Atlas of South Africa. Fourteen (14) species was listed within this QDS and one species were recorded to have a redlisted status, but it should be taken into account that the record holds the date of October 2000, which is 20 years ago.

Table 8: Red listed Amphibian species

Family	Scientific name	Common name	Red list category
Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bull Frog	Near Threatened

7 SITE SURVEY RESULTS

7.1 Ridge Assessment

Ridges 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. Many Red Data / threatened species of plants and animals inhabit ridges. Due to their threatened status, Red Data species require priority conservation efforts in order to ensure their future survival. As such, the conservation of ridges in Gauteng will contribute significantly to the future persistence of these species.

The development area was assessed in terms of slope to aid the assessment and classification in terms of GDARD requirements (Ridge Guidelines). Once a ridge has been identified, it is further classed according to its level of transformation into different classes.

Slope on an east-to-west elevation average on 1.9 %, with a maximum slope of 3.2 % (Figure 7).

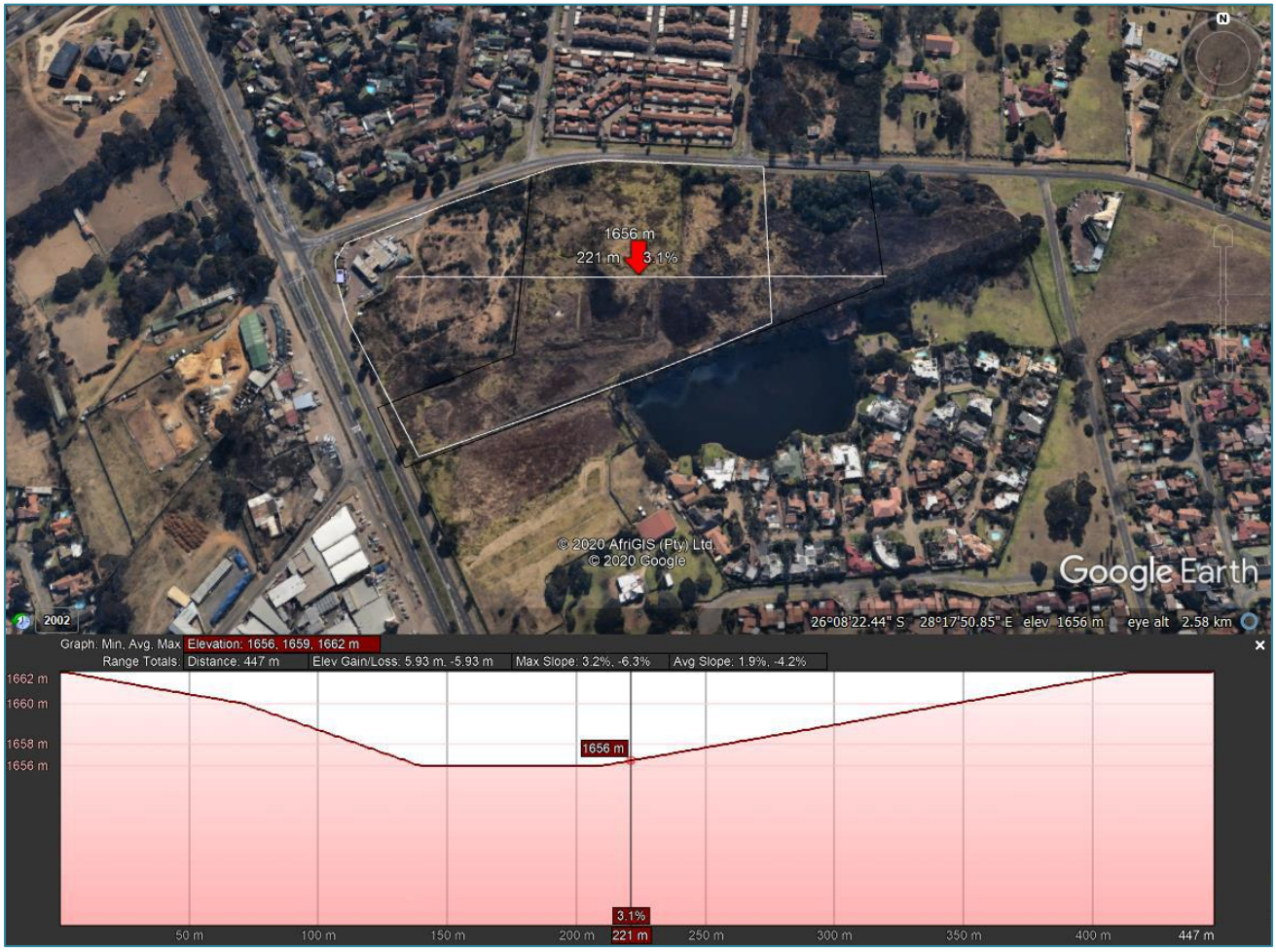


Figure 7: East to West profile of area associated with the development

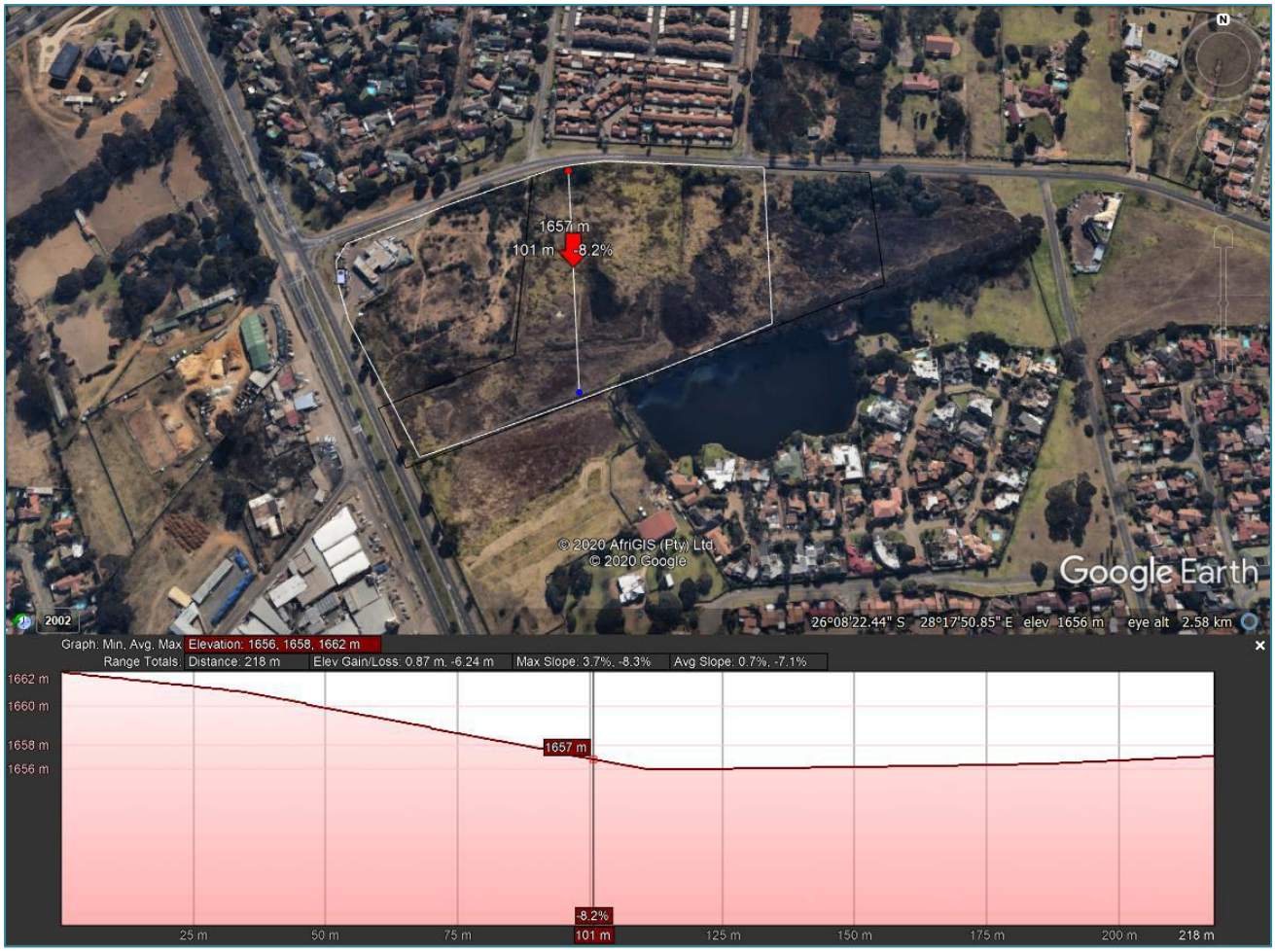


Figure 8: North to South profile of area associated with the development

Average slope is given as 0.7% within the North-to-South elevation profile of the development area. Maximum slope recorded is provided as 3.7 % (Figure 8).

The Department guidelines give the following information regarding the slope and delineation of ridges: *"In addition, ridges are characterized by slopes of 5° or more (that is equivalent to slopes of > 8.8% or > 1: 11 gradient) when modelled in a Geographic Information System digital elevation model that is based on 20 m contour intervals at a scale of 1:50 000".*

According to the calculations of Google Earth, the slope seems to be less than that as indicated by GDARD as a ridge and therefore no further classification will be relevant for the Brentwood development.

None of these will be applicable to the Brentwood development and no ridges occur on-site or will be impacted within a 200m perimeter as the buffer as shown consists only of residential areas and no additional natural habitat (besides the dam and natural areas towards the south-east) needs to be surveyed based on this fact.

7.2 Floral Assessment Results

A site survey was done on the 10th of August 2020. The study area was investigated under the prevailing conditions at the time of the site survey and included late winter conditions. Signs of recent fire were visible across the site. Three broad units were identified and these are as follows:

- Vegetation Unit 1 (VU1): Degraded secondary grassland;
- Vegetation Unit 2 (VU2): Associated Wetland, Pans vegetation;
- Unit 3 (U3): Mixed and transformed land use associated with the built environment

Figure 9: Views showing general condition and characteristics of the area designated for development

A total of fifty-five (55) species were found to occur within the site and have been divided between the representative units delineated below based on overall composition and distribution. The full list is provided in Appendix C.

Eighteen (18) of the floral species recorded during the site survey are of conservation concern (SCC). Some of these species are classified as invasive vegetation by NEM:BA and others are also classified as either a weed or an invader by CARA.

Species categorized as invaders 1b by NEM:BA identified on site total thirteen (13). Three (3) species were classified as category 2 invasive and two (2) classified as category 3 invasive species.

Species pertaining to CARA identified on site consist of fifteen (15) species; eight (8) species fall within Category 1, five (5) species within Category 2 and two (2) species as Category 3 invaders.

Figure 10: Study area delineated into units and habitat available which included a 200 m buffer in red

7.2.1 Vegetation Unit 1 (VU1): Secondary Impacted Grassland

Vegetation in this unit consists of grassland mottled with invasive species and stands of trees found throughout the vegetation unit.

Thirty-five (35) plant species were identified in the unit of which eighteen (18) are exotic species. The dominant tree species observed within the unit comprise mostly of invasive tree species, namely *Acacia decurrens* (Green wattle), *Robinia pseudoacacia* (Black Locust Tree) and to a lesser degree *Acacia dealbata* (Silver wattle) and *Albizia* sp.

The graminoid layer of vegetation consists of species such as *Hyparrhenia hirta* (prominent within the unit), *Imperata cylindrica*, *Eragrostis curvula*, *Eragrostis chloromelas, Sporobolus stapfianus, Pogonarthria squarrosa, Agrostis lachnantha* and *Cynodon dactylon* (also prominent). In addition to the grasses (Poaceae), one stand of the giant reed *Arundo donax* was observed. It should be noted again that due to the recent fire that occurred within the study area and the wintery conditions the grasses identified are limited, and that studies done within the rainy season might yield a more thorough result of the graminoid layer in question.

Forbs consisted mainly of invasive or pioneer species taking advantage of the disturbed conditions and some of the forbs included; *Argemone mexicana*, *Plantago lanceolata*, *Sonchus oleraceus*, *Cotula anthemoides* and *Helichrysum argyrosphaerum*.

Bulbous plants identified comprise of one species, namely *Dipcadi marlothii* found in a small part as a colony within the study unit. Again, the identification of geophyte bulbs is limited by the late winter condition at the time of the survey and does not necessarily reflect the true condition of the bulbous plants within the study area.

The vegetation unit is very much disturbed with taller herbs, with the exception of *Gomphocarpus fruticosus,* all being highly invasive such as the Red Sesbania *(Sesbania punicea)* and the common thorn apple *(Datura stramonium)* observed in numbers.

Two plants of garden origin were also observed within the unit namely *Beschorneria yuccoides* (Mexican lily) and *Alcea rosa* (Hollyhock). The occurrence of these plants within the unit is likely due to the dumping of garden refuse within the area.

Figure 11: Photographs taken of areas representing Secondary Grassland VU (Photo 1 –areas representing zones in better condition)

Table 9: General species found in Impacted Grassland areas (VU1)

Number	Name	Common name	NEM:BA AIPs	CARA	IUCN	TOPS 2013	GDARD 2014	TNCO 1983	Protected trees
1	*Verbena brasiliensis*	Brazilian vervain	1b	-	-	-	-	-	-
2	*Tagetes minuta*	Khaki bush	-	-	-	-	-	-	-
3	*Sida dregei*	Spider-leg	-	-	-	-	-	-	-
4	*Erigeron bonariensis*	Fleabane	-	-	-	-	-	-	-
5	*Bidens pilosa*	Black jack	-	-	-	-	-	-	-
6	*Melia azedarach*	Syringa	3	3 Invader	-	-	-	-	-
7	*Solanum mauritianum*	Bugweed	1b	1 Weed	-	-	-	-	-
8	*Robinia pseudoacacia*	BlackLocust Tree	1b	2 Invader *	-	-	-	-	-
9	*Gomphocarpus fruticosus*	Milkweed	-	-	-	-	-	-	-
10	*Acacia decurrens*	Green wattle	2	2 Invader	-	-	-	-	-
11	*Sesbania punicea*	Red Sesbania	1b	1 Weed	-	-	-	-	-
12	*Albizia* sp.		1b	1 Weed	-	-	-	-	-
13	*Imperata cylindrica*	Cottonwool Grass	-	-	-	-	-	-	-
14	*Agrostis lachnantha*	Bent grass	-	-	-	-	-	-	-
15	*Beschorneria yuccoides*	Mexican lily	-	-	-	-	-	-	-
16	*Eragrostis curvula*	Weeping love grass	-	-	-	-	-	-	-
17	*Sporobolus stapfianus*	Fibrous dropseed	-	-	-	-	-	-	-
18	*Argemone mexicana*	Mexican poppy	1b	1 Weed	-	-	-	-	-
19	*Verbena rigida*	Veined verbena	1b		-	-	-	-	-
20	*Plantago lanceolata*	Ribwort	-	-	-	-	-	-	-
21	*Sonchus oleraceus*	Sow thistle	-	-	-	-	-	-	-
22	*Descurainia sophia*	Flixweed	-	-	-	-	-	-	-
23	*Cotula anthemoides*	Gansgras	-	-	-	-	-	-	-
24	*Helichrysum argyrosphaerum*	Poprosie	-	-	-	-	-	-	-
25	*Eragrostis chloromelas*	Curly leaf (narrow) love grass	-	-	-	-	-	-	-
26	*Pogonarthria squarrosa*	Herringbone grass	-	-	-	-	-	-	-
27	*Datura stramonium*	Common thorn apple	1b	1 Weed	-	-	-	-	-
28	*Acacia dealbata*	Silver wattle	2	2 Invader	-	-	-	-	-
29	*Sonchus wilmsii*	Milk thistle	-	-	-	-	-	-	-
30	*Dipcadi marlothii*		-	-	-	-	-	-	-

31	*Alcea rosa*	Hollyhock	-	-	-	-	-	-	-
32	*Cynodon dactylon*	Bermuda grass	-	-	-	-	-	-	-
33	*Araujia sericifera*	Moth catcher	1b	1 Weed	-	-	-	-	-
34	*Arundo donax*	Giant reed	1b	1 Weed	-	-	-	-	-
35	*Hyparrhenia hirta*	Common Thatching Grass	-	-	-	-	-	-	-

7.2.2 Vegetation Unit 2 (VU2): Associated Wetland, Pans vegetation

Thirty-six (36) plant species were recorded in this VU of which thirteen (13) species are exotic.

The trees observed within the vegetation unit area consists mostly the invasive wattles, *Acacia decurrens* (Greenwattle), and *Acacia pycnantha* (Golden wattle) observed in dense stands within and around of the riparian area, other trees observed in less numbers and less dense stands are *Melia azedarach* (Syringa), *Eucalyptus camaldulensis (Red river gum), Morus sp. (Mulberry)* and *Populus x canescens* (Grey poplar).

The graminoid layer in and around the riparian area consists of dense stands of the Bull rush (*Typha capensis*) and the indigenous reed (*Phragmites australis*). Sedge species observed were Juncus *effusus* (Soft rush) and *Schoenoplectus muricinux.* Other sedges were present but unidentifiable due to being burned down by a fire recently. The grass layer was dominated in areas by *Imperata cylindrica* (Cottonwool grass) and in other areas by *Pennisetum clandestinum (Kikuyu)* with *Andropogon* species also found in dense stands. Other grass species observed within the unit are *Agrostis lachnantha* (Bent grass), *Setaria sphacelate* (Common bristle grass) and two (2) *Eragrostis spp.*

Other floral species observed within the unit comprise mostly the invasive species listed below, this is because the area is disturbed, but limitations as mentioned of the study should also be kept in mind.

Table 10: General species observed within Vegetation Unit 2

Number	Name	Common name	NEM:BA AIPs	CARA	IUCN	TOPS 2013	GDARD 2014	TNCO 1983	Protected trees
1	*Verbena brasiliensis*	Brazilian vervain	1b	-	-	-	-	-	-
2	*Trifolium repens*	White clover	-	-	-	-	-	-	-
3	*Erigeron bonariensis*	Fleabane	-	-	-	-	-	-	-
4	*Eucalyptus camaldulensis*	River red gum	1b	2 Invader	-	-	-	-	-
5	*Bidens pilosa*	Black jack	-	-	-	-	-	-	-
6	*Melinis repens*	Natal Red Top	-	-	-	-	-	-	-
7	*Melia azedarach*	Syringa	3	3 Invader	-	-	-	-	-
8	*Acacia pycnantha*	Golden wattle	1b	1 Weed	-	-	-	-	-
9	*Solanum mauritianum*	Bugweed	1b	1 Weed	-	-	-	-	-
10	*Typha capensis*	Bullrush	-	-	-	-	-	-	-
11	*Cyperus spp*	Sedge	-	-	-	-	-	-	-
12	*Andropogon eucomis*	Snowflake grass	-	-	-	-	-	-	-
13	*Andropogon huillensis*	Large Silver Andropogon	-	-	-	-	-	-	-
14	*Schoenoplectus muricinux*		-	-	-	-	-	-	-
15	*Juncus effusus*	Soft Rush	-	-	-	-	-	-	-
16	*Helichrysum setosum*	Yellow everlasting	-	-	-	-	-	-	-
17	*Gomphocarpus fruticosus*	Milkweed	-	-	-	-	-	-	-
18	*Acacia decurrens*	Green wattle	2	2 Invader	-	-	-	-	-
19	*Morus spp*	Mulberry	3	Invader 3 *	-	-	-	-	-
20	*Populus x canescens*	Grey poplar	2	Invader 2	-	-	-	-	-
21	*Albizia sp*		1b	1 Weed	-	-	-	-	-
22	*Phragmites australis*	Cmmon reed	-	-	-	-	-	-	-
23	*Imperata cylindrica*	Cottonwool Grass	-	-	-	-	-	-	-
24	*Agrostis lachnantha*	Bent grass	-	-	-	-	-	-	-
25	*Setaria sphacelata*	Common bristle grass	-	-	-	-	-	-	-
26	*Eragrostis curvula*	Weeping love grass	-	-	-	-	-	-	-
27	*Sporobolus stapfianus*	Fibrous dropseed	-	-	-	-	-	-	-
28	*Verbena rigida*	Veined verbena	1b	-	-	-	-	-	-
29	*Plantago lanceolata*	Ribwort	-	-	-	-	-	-	-
30	*Descurainia sophia*	Flixweed	-	-	-	-	-	-	-
31	*Eragrostis chloromelas*	Curly leaf(narrow) love grass	-	-	-	-	-	-	-
32	*Sonchus wilmsii*	Milk thistle	-	-	-	-	-	-	-
33	*Plantago longissima*	Lamb's tongue	-	-	-	-	-	-	-
34	*Pennisetum clandestinum*	Kikuyu grass	1b *	-	-	-	-	-	-

35	*Cynodon dactylon*	Bermuda grass	-	-	-	-	-	-	-
36	*Hyparrhenia hirta*	Common Thatching Grass	-	-	-	-	-	-	-
37	*Populus x canescens*	Grey poplar	2	Invader 2	-	-	-	-	-

Figure 12: Photographs taken of areas representing VU 2 (Photo 1 & 2)

Figure 13: Photographs taken of areas representing VU 2 (Photo 3 & 4)

Other degraded sections also falling within this Vegetation Unit, associated with the drains from the main road are shown below:

Figure 14: Drainage features feeding the pans and wetlands found within the area

Figure 15: Drainage features feeding the pans and wetlands found within the area

7.2.3 Unit 3: Mixed and Disturbed land use

This Unit is characterised by transformed areas associated with the built environment, residential and industrial land uses. Minimal natural vegetation remains and vegetation within this unit only consists of those planted in the gardens of the neighbouring residential areas. The small section behind the petrol garage has also been included within this unit based on the fact that it has been subjected to large scale earthworks and maintained Kikuyu grass (*Pennisetum clandestinum*).

Figure 16: Photographs taken of areas representing Transformed (behind the petrol garage)

7.2.4 Ecological status of grasses

A total of twelve (12) grass species were found during the field survey, eleven (11) of which can be used to assess the ecological grass status. None of the species found to occur are considered to be "Decreaser" species. Decreaser species are usually highly palatable climax grasses and are good indicators of the veld condition. These species are abundant in good veld, but they tend to decrease when the veld is overgrazed or undergrazed (Van Oudtshoorn, 2014).

Most of the grasses are indicated as "Increaser II" species (nine (9) species). Increaser II species are abundant in overgrazed veld. These grasses increase as a result of the disturbing effect of overgrazing, human related impacts and veld fires. It mostly includes pioneer and subclimax species such as *Eragrostis regidor* due to the fact that these grasses bare many seeds and easily multiply and establish themselves.

Only three (3) of the species that occurred is classified as "Increaser I" species. Increaser I species tend to increase in underutilised veld and includes unpalatable climax/subclimax grasses such as *Trachypogon spicatus*.

Table 11: Ecological description of grasses

Species	Grazing value	Plant succession	Grazing status
Andropogon eucomis	Low	Subclimax	Increaser II
Pogonarthria squarrosa	Low	Subclimax	Increaser II
Cynodon dactylon	High	Pioneer	Increaser II
Eragrostis chloromelas	Average	Climax & subclimax	Increaser II
Eragrostis curvula	Average	Climax & subclimax	Increaser II
Pennisetum clandestinum	High	Exotic	
Hyparrhenia hirta	Low	Climax & subclimax	Increaser I
Andropogon huillensis	Average	Climax	Increaser I
Agrostis lachnantha	Average	Pioneer	Increaser II
Imperata cylindrica	Low	Common weed	Increaser I
Melinis repens	Low	Pioneer & subclimax	Increaser II
Sporobolus stapfianus	Low	Climax & subclimax	Increaser II

7.2.5 Invasive species

Invasive and exotic species tend to increase in disturbed environments (DEA & DMR, 2013). Therefore, the construction and operational phases of developments can increase the spread and growth of invasive species. Eight (8) species not indigenous to South Africa were recorded during the site survey of which six (6) species are listed as alien and invasive species in NEM:BA, 2004 (Act 10 of 2004) and are presented in the table below.

Table 12: NEM:BA Category AIP species recorded during site survey

Number	Name	Common name	NEMBA AIPs
1	*Verbena brasiliensis*	Brazilian vervain	1b
2	*Eucalyptus camaldulensis*	River red gum	1b
3	*Melia azedarach*	Syringa	3
4	*Acacia pycnantha*	Golden wattle	1b
5	*Solanum mauritianum*	Bugweed	1b
6	*Robinia pseudoacacia*	Black Locust Tree	1b
7	*Acacia decurrens*	Green wattle	2
8	*Sesbania punicea*	Red Sesbania	1b
9	*Morus* sp.	Mulberry	3
10	*Populus x canescens*	Grey poplar	2
11	*Albizia* sp.		1b
12	*Phragmites australis*	Cmmon reed	
13	*Argemone mexicana*	Mexican poppy	1b
14	*Verbena rigida*	Veined verbena	1b
15	*Datura stramonium*	Common thorn apple	1b
16	*Acacia dealbata*	Silver wattle	2
17	*Pennisetum clandestinum*	Kikuyu grass	1b *
18	*Araujia sericifera*	Moth catcher	1b
19	*Arundo donax*	Giant reed	1b

Thirteen (13) of the Alien and Invasive Plants (AIP) found on the study site are classified as Category 1b invasive plants. Category 1 is the strictest category of species and none of these species are allowed to occur and/or become established on any land area except for the use of a biological control reserve. They possess characteristics that are harmful to humans, animals or the environment. Category 1b is described in NEM:BA as invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove.

Three (3) species found during the field assessment, namely *Acacia decurrens* (Green Wattle), *Populus x canescens* (Grey poplar), and *Acacia dealbata* (Silver wattle) is a Category 2 plant species. Category 2 AIP are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.

Two (2) species found within the study area are classified as Category 3 invaders namely *Morus sp.*(Mullberry) and *Melia azedarach* (Syringa). Category 3 invaders are described NEMBA as invasive species that may not be propagated or grown in any way, conveying or moving or translocating of a specimen categorized as such, selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen, spreading or allowing the spread of any specimen of a listed invasive species, and introduction of a specimen of an alien or a listed invasive species to offshore islands.

7.2.6 Medicinal species

Some of the species that were encountered during the field survey have cultural and/or medicinal use. These species are listed in the table below (Table 13).

Table 13: Medicinal plant species recorded during site survey (van Wyk, van Oudtshoorn, & Gericke, 2011)

Species	Common name
Gomphocarpus fruticosus	Milk weed
Eucalyptus camaldulensis	River red gum
Hyparrhenia hirta	Common Thatching Grass
Typha capensis	Bullrush

These plants are important from a cultural perspective and are used for traditional/cultural purposes. Traditional medicine in South Africa is an important practice on which seventy two percent of the Black African population relies, that accounts for 26.6 million consumers and approximately 133 000 people are employed in the trade of traditional medicine, especially rural women. (Mander, Ntuli, Diederichs, & Mavundla, 2007).

The AIP species *Eucalyptus camaldulensis* found on site may be used for traditional medicine, but this does not exclude them from being invasive and therefore should be treated accordingly.

7.3 Faunal Assessment Results

7.3.1.1 Habitat integrity and Faunal species found

The area has been largely transformed and only typical urban avifaunal species were sighted during the field assessment. Smaller mammals were also observed (signs and dung), but the faunal community has been vastly impacted and the habitat support offered by this area is seen as very low.

Several foot paths were observed during the field assessment based on the fact that humans will utlise the park to cross towards the other side of the road and also remaining fires of informal squatters have been observed. It was also evident that stray dogs currently utilise the area as a hunting ground and several were sighted raiding the wetland terrain during the field assessment.

Table 14: Species observed within and around the project area

Family	Species	Common Name	Sighting/Finding	Status and IUCN
Agelenidae	*Sp unknown*	Funnel-web spiders	Sightings in grass areas	Least Concern
Sparassidae	*Pseudomicrommata longipes*	Grass huntsman/ groot-dwaal krap spinnekop	Sightings	Least Concern
Nymphalidae	*Danaus chrysippus*	African Monarch	Sighting	Least Concern
No Reptilian species were found during the field assessment, and potential habitat were though scarce in the specific footprint or buffer area				

Family	Species	Common Name	Sighting/Finding	Status and IUCN
No Amphibian species were found during the field assessment, but potential habitat will be associated with the wetland, pans and dam located within a private residence (complexes) found to the southern side of the area.				
Herpestidae	*Cynictis penicillata*	Mongoose sp.	Droppings	Least Concern
Pedetidae	*Pedetes capensis*	Springhare	Droppings and middens	Least Concern
Leporidae	*Lepus saxatilis*	Scrub Hare	Droppings	Least Concern
Pycnonotidae	*Pycnonotus tricolor*	Bulbul, Dark-capped	Sightings	Least Concern
Passeriformes	*Cisticola chiniana*	Cisticola, Rattling	Sightings	Least Concern
Numididae	*Numida meleagris*	Guineafowl, Helmeted	Sightings	Least Concern
Charadriidae	*Vanellus armatus*	Lapwing, Blacksmith	Sightings	Least Concern
Hirundinidae	*Riparia cincta*	Martin, Banded	Sightings	Least Concern
Ploceidae	*Ploceus velatus*	Masked-weaver, Southern	Sightings	Least Concern
Burhinidae	*Burhinus capensis*	Thick-knee, Spotted	Sightings	Least Concern

The faunal investigation provides a description of the ecological diversity in terms of species identification as well as the occurrence of threatened/sensitive species that is dependent on available habitat. No Species of Conservation Concern (SCC) were sighted or thought to occur due to the degraded nature of the vegetation units and associated habitat.

The most important species and habitat of concern that will lead the management is determined to be:

- Species with specialized niches (riverine, ridges or wetland areas).

8 SENSITIVITY MAPPING AND GEOSPATIAL ANALYSIS

The objective of a sensitivity mapping exercise is to determine the location and extent of all sensitive areas that must be protected from transforming land uses. A development proposal is only considered compatible with the biodiversity sensitivities of the site if all sensitive areas are avoided and are incorporated into an open space system.

The known Vegetation Groups, the Conservation plan and the field assessment were used as a general guideline to determine the conservation targets and current conservation of the area to be impacted by the activities (Please refer to Figure 6 for a visual illustration). Important areas (CBA) were found to be the dominant status where the activities are proposed.

The wetland and pan related habitats, remaining grasslands patches were found to be the most sensitive areas within the proposed activities. These areas represent specialised niches and habitat for certain insects, reptiles, amphibian and bird species and should be protected as far as possible during all stages of the development and restoration of these areas should be considered or the development of an offset is proposed (specifically for the wetland areas).

According to GDARD requirements, the following requirements is provided:

1. **Vegetation:** All good condition natural vegetation and primary grassland (even if it is in a poor/degraded condition) must be mapped and designated as sensitive. Buffer zones of at least 200m must be provided to mitigate deleterious edge effects.
    - Red List & Orange List plants
      The entire area occupied by populations of Red List and Orange List plant species must be mapped and buffer zones provided to mitigate deleterious edge effects such as the effects of invasive plant and animal species, physical damage and soil compaction caused through trampling and harvesting, abiotic habitat alterations and pollution. Plant populations and protective buffer zones, beginning from the outer edge of the population, must be designated as sensitive.
    - Rules for buffer zone widths are as follows:
        - 200m for Red List and Orange List plant populations occurring within urban areas (all built up areas in Gauteng, including residential, commercial, retail, institutional, educational, industrial and mixed-use developments, where proposed developments are 50 percent abutted by urban development and which can be readily connected to municipal bulk infrastructure services).
        - For Red List and Orange List plant populations occurring within rural areas:
            - 600m for A1 species (taxa endemic to Gauteng)
            - 500m for A2 species (taxa endemic to Gauteng and one other province)

        - 400m for A3 species (taxa endemic to Gauteng and two or more other provinces)
    - 300m for B species (taxa not endemic to South Africa)
- Suitable habitat for expected Red List and Orange List plant species (i.e. those species historically recorded in the area but not located during surveys due to unfavourable environmental conditions) must be mapped and designated as sensitive. Sensitivity mapping is not required for plant taxa listed in the Declining category of the Orange List.

2. ***Red List amphibians*** *(Giant Bullfrog)* - N/A
3. ***Red List reptiles*** - N/A
4. ***Red List or priority invertebrates***
    - Prior to commencement of a survey, landscape scale habitat areas, defined as areas where significant biotic and abiotic environmental variables are more or less constant, must be mapped for the site (Habitat Areas, HA's). A map of plant communities produced during a vegetation survey for the site will suffice where such a map may be available. However, the invertebrate specialist may undertake to produce a map for the site more appropriate for the target invertebrate species if it is deemed necessary.
    - These habitat areas should be classified as natural or transformed areas, where natural areas consist primarily of natural vegetation (regardless of whether it is primary or secondary vegetation) and transformed areas consist primarily of anthropogenic land cover types such as built up land, roads, mines, erosion, unnatural vegetation cover, cultivated lands/crops or are dominated by alien vegetation.
    - This map must form the basis for the survey of the site by the specialist and all-natural areas must be surveyed appropriately for the target species. Surveys in transformed areas are not required.
    - For those Red List or priority species located on site within the last five years or during the specialist survey, the habitat areas where they were located must be designated as sensitive. An exception to this rule may be made for species known to exhibit an aggregated population dispersion pattern and where individuals do not utilize the entire habitat area. In such cases the extent of the population must be mapped and designated as sensitive.
5. ***Wetlands -*** The wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, must be designated as sensitive. Rules for buffer zone widths are as follows:
    - 30m for wetlands occurring inside urban areas
    - 50m for wetlands occurring outside urban areas

Note that these buffer zones are essential to ensure healthy functioning and maintenance of wetland ecosystems. Larger buffer zones may be required for wetlands supporting sensitive species (refer to mapping rules in species-specific sections). However, no red listed species have been recorded or signs found to occur within the designated area. A wetland specialists investigation has/will be undertaken and the appropriate buffers based on the wetland delineation must be determined and fall outside the scope of this report.

As stated, no red listed animals have been found or thought to occur within the site designated for development, however, the wetland and pan associated vegetation unit (VU2) had been rewarded with Medium sensitivity to cater for the requirement as possible habitat. The dam within the buffer have been included as Medium Sensitivity, since it is within a residential area on private property and therefore not likely to sustain red listed species, but still constitute important habitat extension for VU2 (ecological corridor). The area is generally thought to be impacted and degraded (and therefore not awarded High sensitivity which is usually awarded to sensitive features such as wetlands and pans) and no signs of red listed species were found to occur.

The artificial channels leading from the road towards the south has been included in VU2 above, but have been separated in the sensitivity analysis and included within the Low sensitivity group below based on the fact that these sections, although sedges and rushes occur (hydrophytic vegetation), are artificial in nature and filled with litter. These channels will cease to exist once the stormwater features for this property has been formally designed. It is recommended that once formally designed, clean stormwater be diverted around the property still allowing it to reach the natural environment.

Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as Medium sensitivity. The wetland buffers as delineated and recommended by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance.

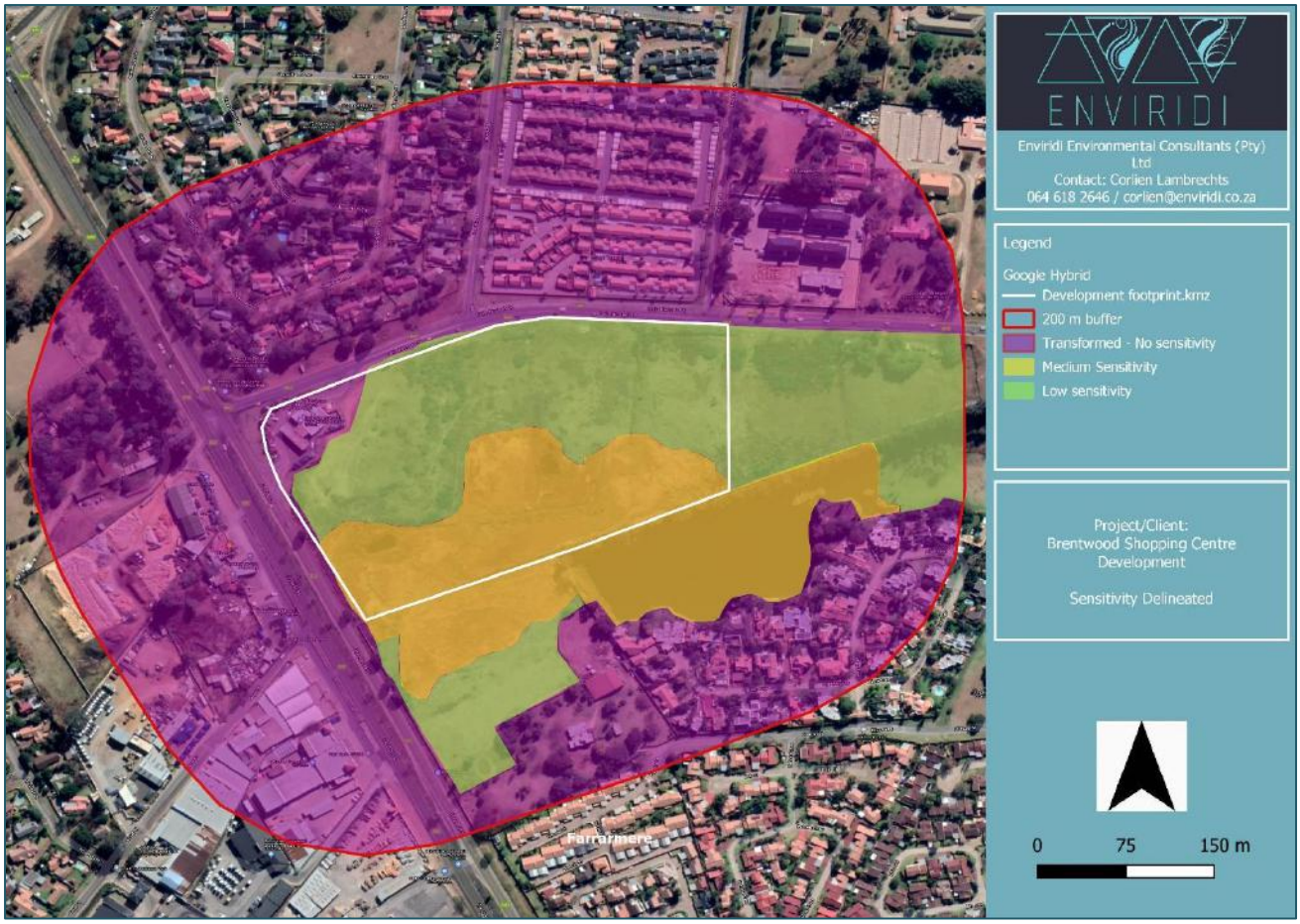


Figure 17: Sensitivity delineated according to habitat remaining condition thereof (Including drainage systems and possible wetlands)

IMPACT ASSESSMENT

9 ENVIRONMENTAL IMPACT ASSESSMENT

All forms of development will have an immediate effect on the natural environment. It is therefore of utmost importance to provide information on the environmental consequences these activities will have and to inform the decision-makers thereof.

The preferred format has been incorporated into the document and an explanation of the impact assessment criteria is defined below (Table 15).

9.1 Methodology

Risk assessment involves the calculation of the magnitude of potential consequences (levels of impacts) and the likelihood (levels of probability) of these consequences to occur. Risk = Consequence + Likelihood; where: (i) likelihood is the probability of occurrence of an impact that affects the environment; and, (ii) consequence is the environmental impact if an event occurs.

Consequence can be calculated as the sum of the risk levels comprising environment type, nature, extent and duration of the potential impact. Likelihood can be calculated as the sum of the risks of frequency and probability of the impact occurring. The likelihood and consequence can input into a matrix in order to identify the significance of the risk occurring. The C + L matrix method therefore combines the scores from the qualitative or semi-quantitative ratings of consequence (levels of impact) and the likelihood (levels of probability) that a specific consequence will occur (not just any consequence) to generate a risk score and risk rating.

Table 15: Impact Assessment Criteria defined

Assessment	Definition	Quantification				
		1	2	3	4	5
Environment Type	Type of environment anticipated to be impacted	Degraded sites/ heavy industrial areas/ high density townships	High density residential/ retail and office complexes/ central business districts/ medium industrial/ large- scale agriculture[4]	Medium density residential/ light industrial/ office parks/ sports facilities/ medium- scale agriculture[5]	Low density residential/ small-scale agricultural[6]/ small holdings	Greenfield sites/ nature reserves/ protected areas/ natural recreational facilities
Nature	The potential of the impact to cause harm	Negligible Impact	Minor Impact	Moderate Impact	High Impact	Severe/Irreversible Impact
Extent	The spatial extent or population extent of an impact	Within project area (<500m from project)	Surrounding area (500m – 1km radius)	Outside project area (1 – 5km radius)	Regional and provincial (5 – 50km radius)	National or international (>50km radius)
Duration	The period the impact will interact with the receiving environment	Immediate (days)	Short term (weeks)	Medium term (months)	Long term (years)	Beyond life of project
Frequency	How often the impact will occur	Less than once a year	Annually	Monthly	Weekly	Daily
Probability	The likelihood of the impact occurring	Rare	Unlikely	Possible	Likely	Almost certain

[4] Large Scale Agricultural *viz.* commercial tree plantations, etc.
[5] Medium Scale Agricultural *viz*. crop and cattle farming, etc.
[6] Small Scale Agricultural *viz.* nurseries and fish farms, etc.

The following significance rating can be derived from the ratings matrix:

Environmental Significance			Description of Rating
	2 – 8	Low Significance	No specific management action required
	9 – 11	Medium-low Significance	Administrative management actions required
	12 – 17	Medium Significance	Management and monitoring action plans required
	18 – 23	Medium-high Significance	Specific management and monitoring plans required
	24 – 30	High Significance	Detailed management and monitoring plans required, potential red flag impact

9.2 IMPACT ASSESSMENT AND MITIGATION MEASURES

9.2.1 Risk Assessment

9.2.1.1 Construction Phase and Operational Phase

Construction Impacts on the Natural environment

Impact

The site is largely degraded and habitat has been transformed, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat.

The wetland associated areas will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the compromised area.

Mitigation

- Stilts and other features could be considered for the shopping centre and this will preserve the remaining functioning of the wetland unit where possible, since the wetland is no longer deemed functional and in good ecological health. However, a wetland delineation and specialist investigation should be conducted by a wetland specialist.
- Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary.
- Adhere to all management and mitigation measures as prescribed within the wetland specialist report.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Continuous rehabilitation of the area should occur, immediate closure and rehabilitation of any areas dug during the construction of the stilts and foundations. This will entail the spreading of topsoil, revegetation and management of invasive species.
- Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment.

Potential impact predicted during construction/operation		
Aspect	No Mitigation	With Mitigation
Environment Type	Degraded sites (1)	Degraded sites (1)
Nature	Moderate impact (3)	Low Impact (2)
Extent	Within project area (<500m from project) (1)	Within project area (<500m from project) (1)
Duration	Long term (4)	Short term (2)
Frequency	Monthly (3)	Monthly (3)
Probability	Almost certain (5)	Unlikely (2)
CONSEQUENCE	9	6
LIKELIHOOD	8	5

Significance Rating (SR)	Medium Significance (17)	Medium-Low Significance (11)

Impact

Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas.

Mitigation

- Implement an Alien and Invasive Management Programme, which will aim to remove and manage the plants recorded during the field survey, since most of these species are already listed on the Alien and Invasive Species list as published in 2016 (Department of Environmental Affairs, 2016).
- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.

Potential impact predicted during construction/operation		
Aspect	No Mitigation	With Mitigation
Environment Type	Degraded sites (1)	Degraded sites (1)
Nature	Moderate impact (3)	Negligible Impact (1)
Extent	Within project area (<500m from project) (1)	Within project area (<500m from project) (1)
Duration	Long term (4)	Medium term (3)
Frequency	Monthly (3)	Monthly (3)
Probability	Possible (3)	Unlikely (2)
CONSEQUENCE	9	6
LIKELIHOOD	6	5
Significance Rating (SR)	Medium Significance (15)	Medium-Low Significance (11)

Impact

Impacts on the wetland and water resources located downstream of the transformed wetland system. This may be due to pollutants entering the water resource, specifically petroleum related waste products which could possibly spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones.

Mitigation

- Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary.
- Adhere to all management and mitigation measures as prescribed within the wetland specialist report.
- If possible, find an alternative placement for features of the shopping centre as to prevent placement within a wetland or wetland soils.
- Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment.
- Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater management systems, which should include oil traps.
- Continuous rehabilitation of the area should occur in accordance with the WUL or if an offset agreement is devised and approved, as well as monitoring as prescribed.
- Ensure proper stormwater management and maintenance of this system. Stormwater management will prevent impacts reaching the natural environment.

Potential impact predicted on Fauna		
Aspect	No Mitigation	With Mitigation
Environment Type	Degraded sites (1)	Degraded sites (1)
Nature	Moderate impact (3)	Low Impact (2)
Extent	Outside project area (1 – 5km radius) (3)	Within project area (<500m from project) (1)
Duration	Long term (4)	Medium term (months) (3)
Frequency	Monthly (3)	Monthly (3)
Probability	Almost certain (5)	Unlikely (2)

CONSEQUENCE	11	6
LIKELIHOOD	8	5
Significance Rating (SR)	Medium-high Significance (19)	Medium Significance (11)

9.2.1.2 Closure/Post-Closure Phase for activities

Continuous rehabilitation and clean-up should take place during the construction and operational phase.

Impact

Impacts on the wetland and water resources located downstream during and after closure and demolition. The results may be positive, if invaders have been brought under control during the construction and operational phase of the project, the site may be rehabilitated back to a natural landscape. However, since shopping centres do not usually have a closure phase, no impacts are predicted.

Mitigation

- If closure does occur:
  - Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment.
  - Adhere to all management and mitigation measures as prescribed within the wetland specialist report and Environmental Management Programme.
  - Prevent impacts from reaching downstream water resources by ensuring no spillage and proper handling of infrastructure during removal.
  - Continuous rehabilitation of the area should occur in accordance with the WUL (specifically to the wetlands and pans), as well as monitoring as prescribed.
  - Annual monitoring of the vegetation and habitat types should be instigated until it is sure that the areas have naturally regrown and vegetation is self-sustainable. If the regrowth is unsuccessful, it will be the applicant's responsibility to restore damaged and degraded habitat areas until it reached sustainability.

9.2.1.3 Cumulative impacts

Incremental losses and fragmentation of habitat are two of the more serious cumulative impacts in terms of fauna and flora. Given the largely transformed and degraded nature of the surrounding landscape, the characteristics and sensitivity of the affected area, the nature of the proposed development, and the potential for cumulative impacts are expected to be low as the activities and therefor the impacts will increase.

It was not realistically possible or very difficult to perform an impact assessment for the cumulative impacts based on the available information. The most important aspect related to cumulative impact management for the shopping centre, will be to prevent contamination of the surrounding environment, especially in this case with petroleum related waste products stemming from parking areas and vehicle access and this impact is not easily reversed and remediated if it reaches the wetland and/or surface water environments.

MITIGATION AND MANAGEMENT

10 TERRESTRIAL MANAGEMENT PLAN AND RECOMMENDATIONS

10.1 Pre-Construction Phase

- General preference in terms of layout will be within those areas delineated as Low sensitivity. In this case it might be difficult and the development should cater for unstable soil conditions found associated with wetland terrain. A geotech study is recommended to indicated unstable soils due to the underlying wetland conditions found within this area;
- Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as Medium sensitivity. The wetland buffers as delineated and recommended by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance;
- Adhering to sensitivity areas delineated and delineated buffers will also ensure minimal impacts related to vegetation clearance practices;
- A WUL in terms of the National Water Act, 1998 (Act No. 36 of 1998) (Water Use Licence) for activities within 500 metres of wetlands or within 100 m of drainage lines may be required;
- No relevant authorisation is needed for any protected species in terms of NEM:BA (ToPS List or other authorisations) based on the data gathered during the assessment, unless the situation changes and a species listed Nationally or Provincially will need to be relocated or encountered during the construction phase. A specialist should be consulted immediately.

10.2 Construction and Operational Phases

Aims and Objectives

- A suitable responsible person should be appointed during the construction phase to ensure that no unnecessary ecological impacts occur or animal is harmed and no breeding ground or unexpected discovery of red listed/sensitive animals that may require relocation is handled incorrectly by uninformed personnel;
- If possible, consider utilisation of stilts for the shopping centre areas which fall within a wetland or wetland soils or an offset agreement for the loss of the buffer/wetland zone should be considered, alternatively, infrastructure could be moved to provide different alternative layouts which could be assessed by the Competant Authority (GDARD and DHSWS);
- Prevent the needless loss of or damage to flora particularly with regard to protected, endemic, near-endemic and rare species to keep the specific habitat type as unaltered as possible. This will include the active management of Alien and Invasive species around the perimeter of the shopping centre and on the property, since most species recorded during the field survey is Not Indigenous, a Listed Invader or Invasive of nature;
- Prevent death, injury or hindrance to any fauna encountered during the project phases, and particularly with regard to any protected or endemic species;
- Prevent significant alteration to the ecosystems in the area, specifically, the wetland zones, adhere to all measures as described in the specialist wetland assessment;
- Prevent impacts from reaching the downstream river environments at any stage of the development as these will impact the aquatic life within the systems as well as impact all the animals using the water resources on-site as well as downstream.

Ecological Mitigation and Management measures

- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora that is endemic and serve as habitat for the animals inhabiting the area.
- Allow animals to escape areas of activity freely and do not hinder their movement.
- All activities should be preferably restricted to one area as delineated within the formal layout. Strict measurements should be implemented.

- Although the wetland have been found to be impacted, it still remains the most sensitive areas associated with the specific site and therefore, activity should be avoided in possible wetland zones (including after construction), incorporating those findings from the wetland assessment done for the project, unless authorisations are obtained for this, then management of these activities will be important.
- An Offset could be considered; however, offsets often fail due to inadequate planning; therefore, a wetland specialist should describe, design and formulise the plan to ensure success of implementation thereof. Specific targets need to be met for an offset to be approved. This should not be the first choice for the project.
- Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as Medium sensitivity. The wetland buffers as delineated and recommended by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance.

Monitoring

Monitoring framework should be instigated and managed by their responsible body and the following system may enforce good practice:

- Implement an “Observe and report” approach which will enable employees to report any disturbance of flora/fauna or degradation that they encounter.
- Alien invasive awareness, eradication and control programme on an annual basis.

11 CONCLUSIONS

The project area is located in the Gauteng Province near Brentwood on the corner of the Great North Rd/R23 and Celia Nestadt Road within the Ekurhuleni Metropolitan and District Municipality.

Within the National Threatened Ecosystems (2011), sections of the site falls within Rietvleiriver Highveld Grassland (GP 7), which has a status of Critically Endangered (CR). This is in contrast with the NBA 2018, indicating the site falls within Soweto Highveld Grassland (as mentioned above, refer to Figure 2), which has a status of Vulnerable (VU).

No ridges occur on-site or will be impacted within a 200m perimeter as the buffer as shown consists only of residential areas and no additional natural habitat (besides the dam and natural areas towards the south-east) needs to be surveyed based on this fact.

A site survey was done on the 10th of August 2020. The study area was investigated under the prevailing conditions at the time of the site survey and included late winter conditions. Signs of recent fire were visible across the site. Three broad units were identified.

A total of fifty-five (55) species were found to occur within the site and have been divided between the representative units delineated below based on overall composition and distribution. The full list is provided in Appendix C. Eighteen (18) of the floral species recorded during the site survey are of conservation concern (SCC). Some of these species are classified as invasive vegetation by NEM:BA and others are also classified as either a weed or an invader by CARA:

- Thirteen (13) of the Alien and Invasive Plants (AIP) found on the study site are classified as Category 1b invasive plants. Category 1 is the strictest category of species and none of these species are allowed to occur and/or become established on any land area except for the use of a biological control reserve. They possess characteristics that are harmful to humans, animals or the environment. Category 1b is described in NEM:BA as invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove.
- Three (3) species found during the field assessment, namely *Acacia decurrens* (Green Wattle), *Populus x canescens* (Grey poplar), and *Acacia dealbata* (Silver wattle) is a Category 2 plant species. Category 2 AIP are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.
- Two (2) species found within the study area are classified as Category 3 invaders namely *Morus sp.*(Mullberry) and *Melia azedarach* (Syringa). Category 3 invaders are described NEMBA as invasive species that may not be propagated or grown in any way, conveying or moving or translocating of a specimen categorized as such, selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen, spreading or allowing the spread of any specimen of a listed invasive species, and introduction of a specimen of an alien or a listed invasive species to offshore islands.

From a faunal and habitat observation point of view, the area has been largely transformed and only typical urban avifaunal species were sighted during the field assessment. Smaller mammals were also observed (signs and dung), but the faunal community has been vastly impacted and the habitat support offered by this area is seen as very low. Several foot paths were observed during the field assessment based on the fact that humans will utlise the park to cross towards the other side of the road and also remaining fires of informal squatters have been observed. It was also evident that stray dogs currently utilise the area as a hunting ground and several were sighted raiding the wetland terrain during the field assessment. No red listed were sighted or thought to occur due to the degraded nature of the vegetation units and associated habitat.

The wetland and pan associated vegetation unit (VU2) had been rewarded with Medium sensitivity to cater for the requirement as possible habitat. The dam within the buffer have been included as Medium Sensitivity, since it is within a residential area on private property and therefore not likely to sustain red listed species, but still constitute important habitat extension for VU2 (ecological corridor). The area is generally thought to be impacted and degraded (and therefore not awarded High sensitivity which is usually awarded to sensitive features such as wetlands and pans) and no signs of red listed species were found to occur.

The artificial channels leading from the road towards the south has been included in VU2 above, but have been separated in the sensitivity analysis and included within the Low sensitivity group below based on the fact that these sections, although sedges and rushes (hydrophytic vegetation) occur, are artificial in nature and filled with litter. These channels will cease to exist once the stormwater features for this property has been formally designed. It is recommended that once formally designed, clean stormwater be diverted around the property still allowing it to reach the natural environment.

Impacts for the development has been assessed and the risk rating has been determined as Medium or Medium-High (without mitigation) and only based on wetland terrain and other pan features found, however, adhering to mitigation measures, the risk will lower towards Medium-Low or Low. Mitigation and management measures are prescribed to ensure the least possible impact on the ecology of the area and should be strictly implemented.

It's the reasoned opinion of the specialist that the development may continue if all mitigation measures are implemented and all areas of medium or high sensitivity are avoided where feasibly possible. Wetlands, pans and hydrophytic vegetation habitat constitute the most important feature which make up the area identified as Medium sensitivity. The wetland buffers as delineated and recommended by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance.

12 REFERENCES

Bates, M., Branch, W., Bauer, A., Burger, M., Marais, J., Alexander.G.J., & de Villiers, M. (2014). *Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland.* Pretoria: South Afircan Biodiversity Institute (SANBI).

Department of Environmental Affairs. (2016). Government Notice No. 864 of 29 July 2016: National Environmental Management: Biodiversity Act, 2004 (ACT NO. 10 OF 2004) Alien and Invasive species list 2016.

Gauteng Provincial Administration. (1983). *Transvaal Nature Conservation Ordinance No. 12 of 1983, date of commencement 1984.*

GDARD. (2014). *Technical Report for the Gauteng Conservation Plan (Gauteng C-Plan v3.3). Gauteng Department of Agriculture and Rural Development: Nature Conservation Directorate. 60 pages.*

Mander, M., Ntuli, L., Diederichs, N., & Mavundla, K. (2007). *Economics of the traditional medicine trade in South Africa.*

Mecenero, S., Ball, J., Edge, D., Hamer, M., Hening, G., Krugger, M., . . . Williams, M. (. (2013). *Conservation assessment of butterflies of South Africa, Lesotho and Swaziland: Red List and atlas. Saftronics (Pty) Ltd.,.*

Mucina, L., & Rutherford, M. (2006). *The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19.* Pretoria: South African National Biodiversity Institute.

Nel, J. (2011). *South African National Biodiversity Institute "GIS Data: Detailed Report: Wetland Freshwater Ecosystem Priority Areas".* CSIR: Principle Researcher .

Power, R., & Verbugt, L. (2014). *The Herpetofauna of the North West: a Literature survey. Department of Economic Development, Environment, Conservation and Tourism. .* North West Provincial Government.

Stuart, C., & Stuart, M. (2013). *A Field Guide to the tracks and Signs of Southern, Central & East African Wildlife" Fourth Revised Edition. Random House Struik (Pty) Ltd.*

Van Oudtshoorn, F. (2014). Guide to Grasses of Southern Africa.

van Wyk, B.-E., van Oudtshoorn, B., & Gericke, N. (2011). Medicinal Plants of South Africa (2nd edition).

Other National Legislation of South Africa:

- NEM:BA: National Environmental Biodiversity Act (Act 10 of 2004)
- Threatened or Protected Species (ToPS List); Species lists published in the Government Gazette No 389 of 16 April 2013

Internet Databases:

South African Legislation Tops List: https://www.environment.gov.za
IUCN: http://iucnredlist.org
Threatened Species Programme: SANBI Red list of South African Plants: http://redlist.sanbi.org
European Commission: www.eusoils.jrc.ec.europa.eu
Web: Biodiversityexplorer.org
SANBI Database: www.sanbi.org
SANBI GIS: www.bgis.sanbi.org
South African Birds Atlas Project 2: sabap2.adu.org.za
Plants of South Africa (POSA): http://newposa.sanbi.org/sanbi/Explore

13 APPENDICES

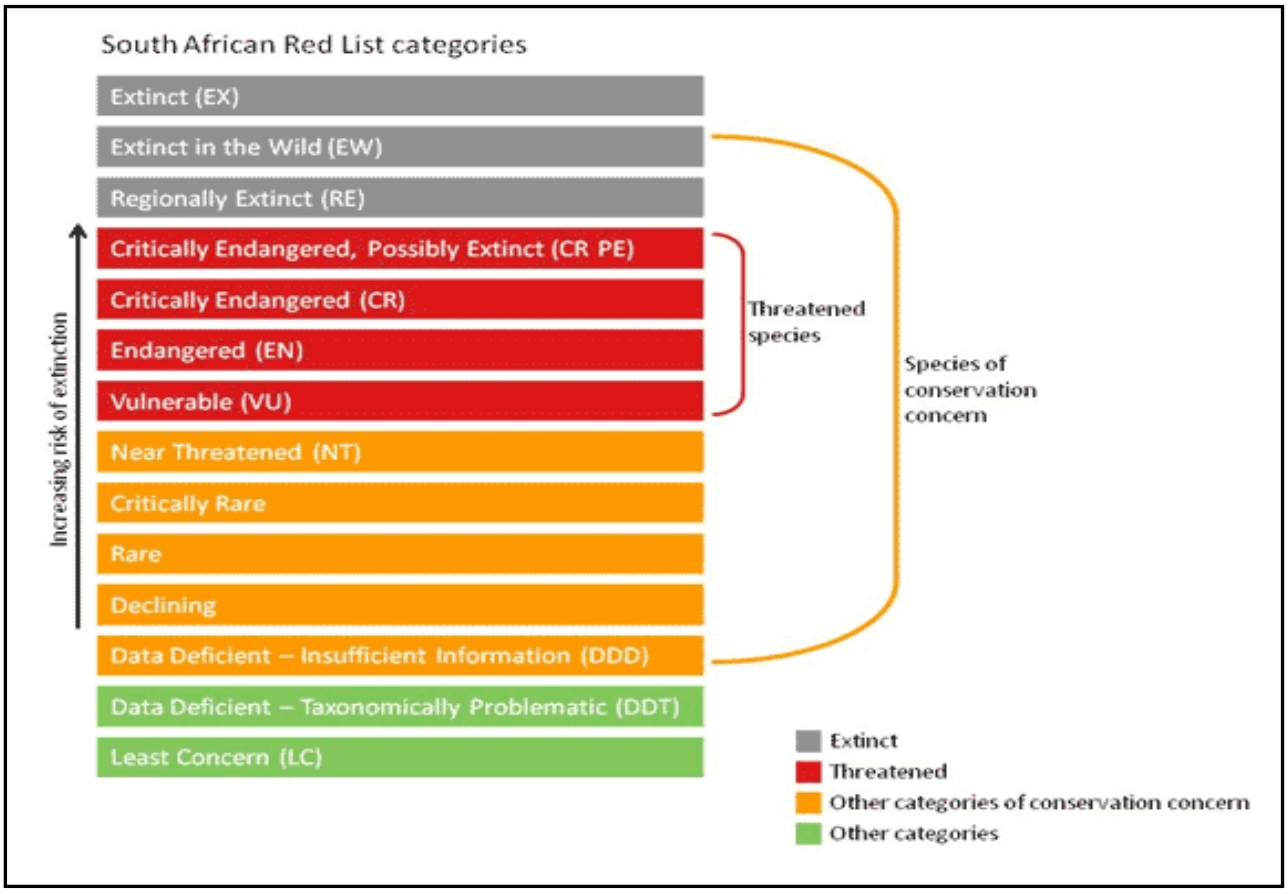
Appendix A: IUCN RED LIST DEFINITIONS
Appendix B: POSA FLORA SPECIES LIST FOR 2628AB QDS
Appendix C: FLORAL SPECIES IDENTIFIED DURING SITE SURVEY
Appendix D: FAUNA SPECIES LIST FOR 2628AB QDS
Appendix E: SPECIALIST CURRICULUM VITAE

APPENDIX A: IUCN RED LIST DEFINITIONS

Categories marked with "[N]" are non-IUCN, national Red List categories for species not in danger of extinction but considered of conservation concern. The IUCN equivalent of these categories is Least Concern (LC).

Categories	Definition
Extinct (EX)	A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
Extinct in the Wild (EW)	A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
Regionally Extinct (RE)	A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
Critically Endangered, Possibly Extinct (CR PE)	Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
Critically Endangered (CR)	A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
Endangered (EN)	A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
Vulnerable (VU)	A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
Near Threatened (NT)	A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable and is therefore likely to become at risk of extinction in the near future.
[N]Critically Rare	A species is Critically Rare when it is known to occur at a single site but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
[N]Rare	A species is Rare when it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows: • Restricted range: Extent of Occurrence <500 km^2, OR • Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy, typically smaller than 20 km^2, OR • Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR • Small global population: Less than 10 000 mature individuals.
[N]Declining	A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.
Least Concern (LC)	A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories.

	Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
Data Deficient / Insufficient Information (DDD)	A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
Data Deficient / Taxonomically Problematic (DDT)	A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
Not Evaluated (NE)	A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.



APPENDIX B: POSA FLORA SPECIES LIST FOR 2628AB QDS

Family	*Scientific Name*	IUCN	TOPS 2013	GDARD	TNCO 1983	NFA	CARA	NEMBA	Growth Form
Acanthaceae	*Thunbergia natalensis*	LC	-	-	-	-	-	-	herb;dwarf,shrub
Acanthaceae	*Crabbea acaulis*	LC	-	-	-	-	-	-	herb
Acanthaceae	*Blepharis stainbankiae*	LC	-	-	-	-	-	-	herb
Acanthaceae	*Justicia anagalloides*	LC	-	-	-	-	-	-	herb
Agavaceae	*Chlorophytum fasciculatum*	LC	-	-	-	-	-	-	herb
Agavaceae	*Chlorophytum cooperi*	LC	-	-	-	-	-	-	herb
Agavaceae	*Chlorophytum transvaalense*	LC	-	-	-	-	-	-	herb
Aizoaceae	*Ruschia sp.*		-	-	-	-	-	-	succulent
Aizoaceae	*Mesembryanthemum cordifolium*		-	-	-	-	-	-	succulent
Alliaceae	*Tulbaghia acutiloba*	LC	-	-	-	-	-	-	herb
Alliaceae	*Tulbaghia leucantha*	LC	-	-	-	-	-	-	herb
Amaranthaceae	*Achyranthes aspera aspera*		-	-	-	-	-	-	herb
Amaranthaceae	*Chenopodium phillipsianum*		-	-	-	-	-	-	herb
Amaranthaceae	*Atriplex suberecta*	LC	-	-	-	-	-	-	herb
Amaranthaceae	*Chenopodium sp.*		-	-	-	-	-	-	
Amaryllidaceae	*Cyrtanthus breviflorus*	LC	-	-	Protected	-	-	-	geophyte
Amaryllidaceae	*Crinum graminicola*	LC	-	-	Protected	-	-	-	geophyte
Amaryllidaceae	*Crinum bulbispermum*	LC	-	-	Protected	-	-	-	hydrophyte; geophyte
Anacardiaceae	*Searsia discolor*	LC	-	-	-	-	-	-	shrub;dwarf
Anacardiaceae	*Searsia pyroides pyroides*	LC	-	-	-	-	-	-	
Anemiaceae	*Mohria vestita*	LC	-	-	-	-	-	-	lithophyte;geophyte, herb
Apiaceae	*Alepidea peduncularis*	DD	-	-	-	-	-	-	herb
Apiaceae	*Centella asiatica*	LC	-	-	-	-	-	-	climber; herb
Apiaceae	*Afrosciadium magalismontanum*	LC	-	-	-	-	-	-	herb
Apocynaceae	*Asclepias stellifera*	LC	-	-	-	-	-	-	herb
Apocynaceae	*Raphionacme hirsuta*	LC	-	-	-	-	-	-	succulent;geophyte, herb
Apocynaceae	*Aspidoglossum restioides*	LC	-	-	-	-	-	-	succulent; herb
Apocynaceae	*Pentarrhinum insipidum*	LC	-	-	-	-	-	-	climber
Apocynaceae	*Cordylogyne globosa*	LC	-	-	-	-	-	-	succulent;geophyte, herb
Apocynaceae	*Aspidoglossum interruptum*	LC	-	-	-	-	-	-	succulent; herb
Apocynaceae	*Asclepias albens*	LC	-	-	-	-	-	-	herb
Apocynaceae	*Aspidoglossum lamellatum*	LC	-	-	-	-	-	-	succulent; herb
Apocynaceae	*Xysmalobium brownianum*	LC	-	-	-	-	-	-	succulent; herb
Apocynaceae	*Asclepias crispa crispa*	LC	-	-	-	-	-	-	herb
Apocynaceae	*Asclepias aurea*	LC	-	-	-	-	-	-	herb

Apocynaceae	*Pachycarpus schinzianus*	LC	-	-	-	-	-	-	succulent; herb
Apocynaceae	*Asclepias eminens*	LC	-	-	-	-	-	-	herb
Aponogetonaceae	*Aponogeton junceus*	LC	-	-	-	-	-	-	tenagophyte; hydrophyte, geophyte,herb
Aponogetonaceae	*Aponogeton natalensis*	LC	-	-	-	-	-	-	epihydate; hyperhydate; hydrophyte; geophyte
Asphodelaceae	*Trachyandra saltii saltii*	LC	-	-	-	-	-	-	succulent; geophyte
Asphodelaceae	*Kniphofia typhoides*	NT	-	-	Protected	-	-	-	succulent; herb
Asphodelaceae	*Bulbine abyssinica*	LC	-	-		-	-	-	succulent; geophyte; herb
Asphodelaceae	*Bulbine narcissifolia*	LC	-	-		-	-	-	succulent; geophyte; herb
Asphodelaceae	*Kniphofia porphyrantha*	LC	-	-	Protected	-	-	-	herb
Asphodelaceae	*Aloe jeppeae*	LC	-	-	Protected	-	-	-	
Asphodelaceae	*Bulbine favosa*	LC	-	-		-	-	-	geophyte; succulent; herb
Asphodelaceae	*Aloe subspicata*		-	-	Protected	-	-	-	
Asphodelaceae	*Trachyandra asperata macowanii*	LC	-	-		-	-	-	succulent; geophyte
Aspleniaceae	*Asplenium adiantum-nigrum adiantum-nigrum*	LC	-	-	Protected	-	-	-	lithophyte; geophyte; herb
Asteraceae	*Ursinia nana leptophylla*	LC	-	-	-	-	-	-	herb
Asteraceae	*Senecio coronatus*	LC	-	-	-	-	-	-	herb
Asteraceae	*Tagetes minuta*		-	-	-	-	-	-	herb
Asteraceae	*Dicoma sp.*		-	-	-	-	-	-	
Asteraceae	*Hilliardiella hirsuta*	LC	-	-	-	-	-	-	herb
Asteraceae	*Senecio venosus*	LC	-	-	-	-	-	-	herb
Asteraceae	*Gnaphalium confine*	LC	-	-	-	-	-	-	herb
Asteraceae	*Launaea rarifolia rarifolia*	LC	-	-	-	-	-	-	herb
Asteraceae	*Senecio lydenburgensis*	LC	-	-	-	-	-	-	herb
Asteraceae	*Pseudognaphalium luteoalbum*	LC	-	-	-	-	-	-	herb; Cryptogenic
Asteraceae	*Helichrysum nudifolium nudifolium*	LC	-	-	-	-	-	-	herb
Asteraceae	*Senecio laevigatus laevigatus*	LC	-	-	-	-	-	-	herb
Asteraceae	*Felicia muricata muricata*	LC	-	-	-	-	-	-	shrub
Asteraceae	*Helichrysum lepidissimum*	LC	-	-	-	-	-	-	herb; shrub
Asteraceae	*Nidorella anomala*	LC	-	-	-	-	-	-	herb
Asteraceae	*Acanthospermum glabratum*		-	-	-	-	-	-	herb

Asteraceae	*Nidorella hottentotica*	LC	-	-	-	-	-	-	herb
Asteraceae	*Helichrysum caespititium*	LC	-	-	-	-	-	-	herb
Asteraceae	*Sonchus nanus*	LC	-	-	-	-	-	-	herb
Asteraceae	Haplocarpha scaposa	LC	-	-	-	-	-	-	herb
Asteraceae	*Polydora angustifolia*	LC	-	-	-	-	-	-	
Asteraceae	*Hilliardiella elaeagnoides*		-	-	-	-	-	-	
Asteraceae	*Gnaphalium filagopsis*	LC	-	-	-	-	-	-	herb
Asteraceae	*Afroaster serrulatus*	LC	-	-	-	-	-	-	
Asteraceae	*Senecio oxyriifolius oxyriifolius*	LC	-	-	-	-	-	-	succulent; herb
Asteraceae	*Schistostephium crataegifolium*	LC	-	-	-	-	-	-	suffrutex; herb
Asteraceae	*Helichrysum callicomum*	LC	-	-	-	-	-	-	herb
Asteraceae	*Helichrysum rugulosum*	LC	-	-	-	-	-	-	herb
Asteraceae	*Osteospermum scariosum scariosum*	NE	-	-	-	-	-	-	herb
Asteraceae	*Helichrysum stenopterum*	LC	-	-	-	-	-	-	herb
Asteraceae	*Dimorphotheca caulescens*	LC	-	-	-	-	-	-	herb
Asteraceae	*Denekia capensis*	LC	-	-	-	-	-	-	herb
Asteraceae	*Senecio erubescens erubescens*	NE	-	-	-	-	-	-	herb
Asteraceae	*Senecio isatideus*	LC	-	-	-	-	-	-	herb
Asteraceae	*Berkheya setifera*	LC	-	-	-	-	-	-	herb
Asteraceae	*Berkheya insignis*	LC	-	-	-	-	-	-	herb
Asteraceae	*Afroaster peglerae*	LC	-	-	-	-	-	-	
Asteraceae	*Dicoma anomala anomala*	LC	-	-	-	-	-	-	herb
Asteraceae	*Senecio sp.*		-	-	-	-	-	-	
Asteraceae	*Tolpis capensis*	LC	-	-	-	-	-	-	herb
Asteraceae	*Oncosiphon suffruticosus*	LC	-	-	-	-	-	-	herb
Asteraceae	*Gazania krebsiana serrulata*	LC	-	-	-	-	-	-	herb
Asteraceae	*Arctotis sp.*		-	-	-	-	-	-	
Asteraceae	*Berkheya radula*	LC	-	-	-	-	-	-	herb
Asteraceae	*Athrixia elata*	LC	-	-	-	-	-	-	dwarf shrub
Asteraceae	*Oncosiphon piluliferus*	LC	-	-	-	-	-	-	herb
Asteraceae	*Helichrysum aureonitens*	LC	-	-	-	-	-	-	herb
Asteraceae	*Helichrysum argyrosphaerum*	LC	-	-	-	-	-	-	herb
Asteraceae	*Nolletia rarifolia*	LC	-	-	-	-	-	-	suffrutex
Asteraceae	*Arctotis arctotoides*	LC	-	-	-	-	-	-	herb
Asteraceae	*Senecio othonniflorus*	LC	-	-	-	-	-	-	herb
Asteraceae	*Cotula coronopifolia*	LC	-	-	-	-	-	-	helophyte; herb
Asteraceae	*Lactuca inermis*	LC	-	-	-	-	-	-	herb
Asteraceae	*Helichrysum setosum*	LC	-	-	-	-	-	-	herb; shrub
Asteraceae	*Crepis hypochaeridea*		-	-	-	-	-	-	herb
Asteraceae	*Conyza podocephala*		-	-	-	-	-	-	herb

Asteraceae	*Pseudopegolettia tenella Indigenous*		-	-	-	-	-	-	
Asteraceae	*Gerbera piloselloides*	LC	-	-	-	-	-	-	herb
Asteraceae	*Dimorphotheca spectabilis*	LC	-	-	-	-	-	-	herb
Asteraceae	*Berkheya zeyheri zeyheri*	LC	-	-	-	-	-	-	herb
Boraginaceae	*Lithospermum cinereum*	LC	-	-	-	-	-	-	herb
Boraginaceae	*Cynoglossum lanceolatum*	LC	-	-	-	-	-	-	herb
Boraginaceae	*Buglossoides arvensis*		-	-	-	-	-	-	herb
Brassicaceae	*Lepidium bonariense*		-	-	-	-	-	-	herb
Brassicaceae	*Descurainia sophia*		-	-	-	-	-	-	herb
Bruchiaceae	*Cladophascum gymnomitrioides*		-	-	-	-	-	-	bryophyte
Caryophyllaceae	*Dianthus mooiensis kirkii*	NE	-	-	-	-	-	-	herb
Caryophyllaceae	*Corrigiola litoralis litoralis*	NE	-	-	-	-	-	-	herb
Caryophyllaceae	*Cerastium capense*	LC	-	-	-	-	-	-	herb
Caryophyllaceae	*Pollichia campestris*	LC	-	-	-	-	-	-	herb
Caryophyllaceae	*Silene gallica*		-	-	-	-	-	-	herb
Caryophyllaceae	*Silene sp.*		-	-	-	-	-	-	
Chrysobalanaceae	*Parinari capensis capensis*	LC	-	-	-	-	-	-	dwarf shrub
Cleomaceae	*Cleome monophylla*	LC	-	-	-	-	-	-	herb
Colchicaceae	*Colchicum striatum*	LC	-	-	-	-	-	-	geophyte
Commelinaceae	*Commelina africana lancispatha*		-	-	-	-	-	-	herb
Commelinaceae	*Cyanotis speciosa*	LC	-	-	-	-	-	-	succulent; herb
Commelinaceae	*Commelina subulata*	LC	-	-	-	-	-	-	helophyte; herb
Commelinaceae	*Commelina livingstonii*	LC	-	-	-	-	-	-	herb
Commelinaceae	*Commelina africana krebsiana*	LC	-	-	-	-	-	-	herb
Convolvulaceae	*Falkia oblonga*	LC	-	-	-	-	-	-	herb
Convolvulaceae	*Cuscuta campestris*		-	-	-	-	1 weed	1b	parasite; herb
Convolvulaceae	*Ipomoea oenotherae oenotherae*	LC	-	-	-	-	-	-	herb
Convolvulaceae	*Ipomoea crassipes crassipes*	LC	-	-	-	-	-	-	succulent; herb
Convolvulaceae	*Ipomoea bathycolpos*	LC	-	-	-	-	-	-	herb
Convolvulaceae	*Ipomoea simplex*	LC	-	-	-	-	-	-	succulent; herb
Convolvulaceae	*Ipomoea ommanneyi*	LC	-	-	-	-	-	-	succulent; herb
Convolvulaceae	*Cuscuta australis*	LC	-	-	-	-	-	-	parasite; herb
Convolvulaceae	*Merremia verecunda*	LC	-	-	-	-	-	-	herb
Convolvulaceae	*Ipomoea obscura obscura*	LC	-	-	-	-	-	-	herb
Crassulaceae	*Crassula setulosa setulosa*	NE	-	-	-	-	-	-	succulent; herb
Crassulaceae	*Crassula capitella nodulosa*	LC	-	-	-	-	-	-	succulent; herb
Crassulaceae	*Kalanchoe tubiflora*		-	-	-	-	-	1b	succulent
Crassulaceae	*Crassula lanceolata lanceolata*	LC	-	-	-	-	-	-	succulent; herb
Crassulaceae	*Cotyledon orbiculata oblonga*	LC	-	-	-	-	-	-	succulent; dwarf shrub

Crassulaceae	*Crassula natans natans*	LC	-	-	-	-	-	-	hydrophyte; succulent
Cucurbitaceae	*Cucumis hirsutus*	LC	-	-	-	-	-	-	succulent; herb
Cyperaceae	*Kyllinga melanosperma*	LC	-	-	-	-	-	-	helophyte
Cyperaceae	*Bulbostylis oritrephes*	LC	-	-	-	-	-	-	mesophyte; cyperoid; herb
Cyperaceae	*Schoenoplectus muriculatus*	LC	-	-	-	-	-	-	cyperoid; helophyte; emergent hydrophyte
Cyperaceae	*Bulbostylis burchellii*	LC	-	-	-	-	-	-	mesophyte; cyperoid; herb
Cyperaceae	*Isolepis fluitans fluitans*	LC	-	-	-	-	-	-	helophyte; cyperoid; emergent hydrophyte
Cyperaceae	*Scirpoides burkei*	LC	-	-	-	-	-	-	mesophyte; cyperoid; herb
Cyperaceae	*Cyperus usitatus*	LC	-	-	-	-	-	-	mesophyte; cyperoid; geophyte; herb
Cyperaceae	*Kyllinga pulchella*	LC	-	-	-	-	-	-	helophyte; cyperoid; herb
Cyperaceae	*Cyperus esculentus esculentus*	LC	-	-	-	-	-	-	mesophyte; cyperoid; geophyte
Cyperaceae	*Schoenoplectus pulchellus*	LC	-	-	-	-	-	-	cyperoid; helophyte; emergent hydrophyte
Cyperaceae	*Cyperus obtusiflorus obtusiflorus*	LC	-	-	-	-	-	-	mesophyte; cyperoid; herb
Cyperaceae	*Fuirena pubescens pubescens*	LC	-	-	-	-	-	-	mesophyte; cyperoid; helophyte; herb
Cyperaceae	*Cyperus congestus*	LC	-	-	-	-	-	-	cyperoid; helophyte; herb
Cyperaceae	*Cyperus marginatus*	LC	-	-	-	-	-	-	helophyte; cyperoid; herb
Cyperaceae	*Cyperus obtusiflorus flavissimus*	LC	-	-	-	-	-	-	herb; mesophyte; cyperoid
Cyperaceae	*Bulbostylis scleropus*	LC	-	-	-	-	-	-	mesophyte;

									cyperoid; herb
Cyperaceae	*Schoenoplectus decipiens*	LC	-	-	-	-	-	-	cyperoid; helophyte; herb
Cyperaceae	*Kyllinga erecta erecta*	LC	-	-	-	-	-	-	helophyte; cyperoid; herb
Cyperaceae	*Fimbristylis complanata*	LC	-	-	-	-	-	-	cyperoid; helophyte; herb
Cyperaceae	*Abildgaardia ovata*	LC	-	-	-	-	-	-	helophyte; mesophyte; cyperoid; herb
Cyperaceae	*Cyperus fastigiatus*	LC	-	-	-	-	-	-	helophyte; cyperoid; herb
Cyperaceae	*Kyllinga alata*	LC	-	-	-	-	-	-	mesophyte; cyperoid; helophyte; herb
Cyperaceae	*Carex spartea*		-	-	-	-	-	-	
Cyperaceae	*Schoenoplectus muricinux*	LC	-	-	-	-	-	-	cyperoid; helophyte; emergent hydrophyte
Cyperaceae	*Cyperus longus tenuiflorus*	NE	-	-	-	-	-	-	cyperoid; helophyte; herb
Cyperaceae	*Carex glomerabilis*	LC	-	-	-	-	-	-	cyperoid; helophyte; herb
Cyperaceae	*Cyperus semitrifidus*	LC	-	-	-	-	-	-	mesophyte; cyperoid; herb
Cyperaceae	*Cyperus uitenhagensis*	LC	-	-	-	-	-	-	mesophyte; cyperoid; herb
Cyperaceae	*Cyperus denudatus*	LC	-	-	-	-	-	-	
Cyperaceae	*Cyperus rigidifolius*	LC	-	-	-	-	-	-	mesophyte; cyperoid; helophyte; herb
Cyperaceae	*Pycreus macranthus*	LC	-	-	-	-	-	-	cyperoid; helophyte; herb
Cyperaceae	*Cyperus difformis*	LC	-	-	-	-	-	-	helophyte; mesophyte; cyperoid; herb
Dipsacaceae	*Cephalaria zeyheriana*	LC	-	-	-	-	-	-	herb
Dipsacaceae	*Scabiosa columbaria*	LC	-	-	-	-	-	-	herb
Ebenaceae	*Diospyros lycioides guerkei*	LC	-	-	-	-	-	-	shrub; tree
Elatinaceae	*Bergia decumbens*	LC	-	-	-	-	-	-	dwarf shrub
Euphorbiaceae	*Acalypha caperonioides*		-	-	-	-	-	-	DD herb; dwarf

	caperonioides								shrub
Euphorbiaceae	*Euphorbia striata*	LC	-	-	-	-	-	-	
Euphorbiaceae	*Euphorbia prostrata*	NE	-	-	-	-	-	-	herb
Euphorbiaceae	*Acalypha angustata*	LC	-	-	-	-	-	-	herb; dwarf shrub
Exormothecaceae	*Exormotheca holstii*		-	-	-	-	-	-	bryophyte
Fabaceae	*Rhynchosia sp.*		-	-	-	-	-	-	
Fabaceae	*Acacia baileyana*	NE	-	-	-	-	Invader 3	3	shrub; tree
Fabaceae	*Trifolium africanum lydenburgense*	NE	-	-	-	-			
Fabaceae	*Acacia dealbata*	NE	-	-	-	-	Weed 2	2	shrub; tree
Fabaceae	*Dichilus lebeckioides*	LC	-	-	-	-	-	-	herb; dwarf shrub
Fabaceae	*Dichilus gracilis*	LC	-	-	-	-	-	-	herb; dwarf shrub
Fabaceae	*Melolobium wilmsii*	LC	-	-	-	-	-	-	dwarf shrub
Fabaceae	*Eriosema nutans*	LC	-	-	-	-	-	-	herb; dwarf shrub
Fabaceae	*Crotalaria globifera*	LC	-	-	-	-	-	-	herb; shrub
Fabaceae	*Chamaecrista biensis*	LC	-	-	-	-	-	-	herb
Fabaceae	*Indigofera oxytropis*	LC	-	-	-	-	-	-	herb
Fabaceae	*Zornia capensis capensis*	LC	-	-	-	-	-	-	herb
Fabaceae	*Tephrosia elongata elongata*	LC	-	-	-	-	-	-	herb; dwarf shrub; shrub
Fabaceae	*Zornia linearis*	LC	-	-	-	-	-	-	herb
Fabaceae	*Indigofera hybrida*	VU	-	-	-	-	-	-	herb
Fabaceae	*Lessertia affinis*	LC	-	-	-	-	-	-	herb
Fabaceae	*Leobordea eriantha*	LC	-	-	-	-	-	-	
Fabaceae	*Erythrina zeyheri*	LC	-	-	-	-	-	-	succulent; dwarf shrub; shrub
Fabaceae	*Dichilus strictus*	LC	-	-	-	-	-	-	herb; dwarf shrub; shrub
Fabaceae	*Indigastrum burkeanum*	LC	-	-	-	-	-	-	herb
Fabaceae	*Elephantorrhiza elephantina*	LC	-	-	-	-	-	-	suffrutex; dwarf shrub; shrub
Fabaceae	*Rhynchosia adenodes*	LC	-	-	-	-	-	-	herb
Fabaceae	*Eriosema salignum*	LC	-	-	-	-	-	-	herb
Fabaceae	*Zornia milneana*	LC	-	-	-	-	-	-	herb
Fabaceae	*Leobordea divaricata*	LC	-	-	-	-	-	-	
Fabaceae	*Lotononis laxa*	LC	-	-	-	-	-	-	herb
Fabaceae	*Dolichos angustifolius*	LC	-	-	-	-	-	-	herb
Fabaceae	*Lessertia frutescens microphylla*	LC	-	-	-	-	-	-	

Fabaceae	*Leobordea arida*	LC	-	-	-	-	-	-	
Fabaceae	*Pearsonia cajanifolia cajanifolia*	LC	-	-	-	-	-	-	herb; shrub
Fabaceae	*Eriosema burkei burkei*	LC	-	-	-	-	-	-	herb
Fabaceae	*Rhynchosia nervosa nervosa*	LC	-	-	-	-	-	-	herb
Fabaceae	*Pearsonia sessilifolia sessilifolia*	LC	-	-	-	-	-	-	herb; dwarf shrub
Fabaceae	*Indigofera zeyheri*	LC	-	-	-	-	-	-	herb; dwarf shrub
Fabaceae	*Listia heterophylla*	LC	-	-	-	-	-	-	Indigenous
Fabaceae	*Lessertia prostata*	LC	-	-	-	-	-	-	herb
Fabaceae	*Vigna unguiculata stenophylla*	LC	-	-	-	-	-	-	climber; herb
Fabaceae	*Trifolium africanum africanum*	NE	-	-	-	-	-	-	herb
Fabaceae	*Vachellia nilotica kraussiana*	LC	-	-	-	-	-	-	
Fabaceae	*Argyrolobium speciosum*	LC	-	-	-	-	-	-	herb
Fabaceae	*Indigofera confusa*	LC	-	-	-	-	-	-	herb
Fabaceae	*Rhynchosia totta totta*	LC	-	-	-	-	-	-	climber; herb
Fabaceae	*Tephrosia capensis capensis*	LC	-	-	-	-	-	-	herb; dwarf shrub; shrub
Gentianaceae	*Sebaea exigua*	LC	-	-	-	-	-	-	herb
Gentianaceae	*Exochaenium grande*	LC	-	-	-	-	-	-	herb
Gentianaceae	*Sebaea leiostyla*	LC	-	-	-	-	-	-	herb
Gentianaceae	*Chironia purpurascens humilis*	LC	-	-	-	-	-	-	herb
Gentianaceae	*Chironia palustris palustris*	LC	-	-	-	-	-	-	herb
Geraniaceae	*Pelargonium luridum*	LC	-	-	-	-	-	-	succulent; geophyte
Geraniaceae	*Monsonia angustifolia*	LC	-	-	-	-	-	-	herb
Geraniaceae	*Pelargonium sidoides*	LC	Protected	-	-	-	-	-	geophyte; dwarf shrub
Geraniaceae	*Pelargonium minimum*	LC	-	-	-	-	-	-	herb
Hyacinthaceae	*Albuca sp.*		-	-	-	-	-	-	
Hyacinthaceae	*Albuca virens arida*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Ornithogalum flexuosum*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Drimia calcarata*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Dipcadi marlothii*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Albuca shawii*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Ornithogalum sp.*		-	-	-	-	-	-	
Hyacinthaceae	*Albuca setosa*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Ledebouria ovatifolia*		-	-	-	-	-	-	geophyte
Hyacinthaceae	*Eucomis autumnalis clavata*	NE	-	-	Protected	-	-	-	geophyte
Hyacinthaceae	*Drimia elata*	DD	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Albuca virens virens*	LC	-	-	-	-	-	-	geophyte

Hyacinthaceae	*Ledebouria sp.*		-	-	-	-	-	-	
Hyacinthaceae	*Ledebouria marginata*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Dipcadi sp.*		-	-	-	-	-	-	
Hyacinthaceae	*Drimia depressa*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Drimia multisetosa*	LC	-	-	-	-	-	-	geophyte
Hyacinthaceae	*Dipcadi viride*	LC	-	-	-	-	-	-	geophyte
Hydrocharitaceae	*Lagarosiphon muscoides*	LC	-	-	-	-	-	-	hydrophyte; herb
Hypericaceae	*Hypericum aethiopicum sonderi*	LC	-	-	-	-	-	-	herb
Hypericaceae	*Hypericum lalandii*	LC	-	-	-	-	-	-	herb
Hypoxidaceae	*Hypoxis iridifolia*	LC	-	-	-	-	-	-	geophyte
Hypoxidaceae	*Hypoxis rigidula rigidula*	LC	-	-	-	-	-	-	geophyte; herb
Hypoxidaceae	*Hypoxis filiformis*	LC	-	-	-	-	-	-	geophyte
Iridaceae	*Iris pseudacorus*		-	-	-	-	-	1a	
Iridaceae	*Babiana bainesii*	LC	-	-	Protected	-	-	-	geophyte; herb
Iridaceae	*Moraea pallida*	LC	-	-	-	-	-	-	geophyte; herb
Iridaceae	*Moraea stricta*	LC	-	-	-	-	-	-	geophyte; herb
Iridaceae	*Hesperantha longicollis*	LC	-	-	-	-	-	-	geophyte; herb
Iridaceae	*Moraea simulans*	LC	-	-	-	-	-	-	geophyte; herb
Iridaceae	*Gladiolus dalenii dalenii*	LC	-	-	Protected	-	-	-	geophyte; herb
Iridaceae	*Gladiolus crassifolius*	LC	-	-	Protected	-	-	-	geophyte; herb
Iridaceae	*Gladiolus robertsoniae*	NT		NT1	Protected	-	-	-	geophyte; herb
Iridaceae	*Aristea torulosa*	LC	-	-	-	-	-	-	herb
Iridaceae	*Gladiolus permeabilis edulis*	LC	-	-	Protected	-	-	-	geophyte; herb
Iridaceae	*Hesperantha coccinea*	LC	-	-	-	-	-	-	geophyte; herb
Iridaceae	*Tritonia nelsonii*	LC	-	-	-	-	-	-	geophyte; herb
Juncaceae	*Juncus oxycarpus*	LC	-	-	-	-	-	-	geophyte; herb
Lamiaceae	*Ocimum obovatum obovatum*	NE	-	-	-	-	-	-	herb
Lamiaceae	*Teucrium trifidum*	LC	-	-	-	-	-	-	herb
Lamiaceae	*Salvia stenophylla*		-	-	-	-	-	-	herb
Lamiaceae	*Syncolostemon pretoriae*	LC	-	-	-	-	-	-	herb
Lamiaceae	*Rotheca hirsuta*	LC	-	-	-	-	-	-	herb
Lamiaceae	*Salvia repens transvaalensis*	LC	-	-	-	-	-	-	herb
Lamiaceae	*Leonotis martinicensis*	LC	-	-	-	-	-	-	
Lentibulariaceae	*Utricularia stellaris*	LC	-	-	-	-	-	-	carnivore; pleustophyte; herb
Limeaceae	*Limeum viscosum viscosum*	NE	-	-	-	-	-	-	herb
Linaceae	*Linum thunbergii*	LC	-	-	-	-	-	-	herb
Lobeliaceae	*Lobelia erinus*	LC	-	-	-	-	-	-	herb
Lobeliaceae	*Lobelia sonderiana*	LC	-	-	-	-	-	-	herb
Lobeliaceae	*Lobelia flaccida flaccida*	LC	-	-	-	-	-	-	herb

Lythraceae	*Ammannia baccifera baccifera*		-	-	-	-	-	-	herb
Lythraceae	*Rotala filiformis*	LC	-	-	-	-	-	-	hydrophyte; herb
Lythraceae	*Nesaea sagittifolia sagittifolia*	LC	-	-	-	-	-	-	dwarf shrub
Lythraceae	*Nesaea schinzii*	LC	-	-	-	-	-	-	dwarf shrub
Malvaceae	*Hermannia lancifolia*	LC	-	-	-	-	-	-	herb
Malvaceae	*Hermannia jacobeifolia*	LC	-	-	-	-	-	-	dwarf shrub
Malvaceae	*Hermannia grandistipula*	LC	-	-	-	-	-	-	herb
Malvaceae	*Hermannia sp.*		-	-	-	-	-	-	
Malvaceae	*Hermannia depressa*	LC	-	-	-	-	-	-	herb
Malvaceae	*Hermannia oblongifolia*	LC	-	-	-	-	-	-	herb
Malvaceae	*Hermannia cordata*	LC	-	-	-	-	-	-	herb
Malvaceae	*Malva parviflora parviflora*		-	-	-	-	-	-	herb
Malvaceae	*Hibiscus microcarpus*	LC	-	-	-	-	-	-	herb
Marsileaceae	*Marsilea capensis*	LC	-	-	-	-	-	-	hydrophyte; herb
Marsileaceae	*Marsilea macrocarpa*	LC	-	-	-	-	-	-	hydrophyte; herb
Molluginaceae	*Psammotropha mucronata mucronata*	LC	-	-	-	-	-	-	herb
Onagraceae	*Oenothera tetraptera*		-	-	-	-	-	-	herb
Onagraceae	*Oenothera stricta stricta*		-	-	-	-	-	-	herb
Onagraceae	*Oenothera rosea herb;*		-	-	-	-	-	-	
Onagraceae	*Ludwigia palustris*		-	-	-	-	-	-	hydrophyte; herb
Orchidaceae	*Habenaria epipactidea*	LC	-	-	Protected	-	-	-	geophyte; herb
Orchidaceae	*Orthochilus leontoglossus*	LC	-	-	Protected	-	-	-	
Orchidaceae	*Habenaria dregeana*	LC	-	-	Protected	-	-	-	geophyte; herb
Orchidaceae	*Eulophia cooperi*	LC	-	-	Protected	-	-	-	geophyte; herb
Orchidaceae	*Habenaria falcicornis caffra*	LC	-	-	Protected	-	-	-	geophyte; herb
Orchidaceae	*Eulophia ovalis ovalis*	LC	-	-	Protected	-	-	-	herb; geophyte
Orchidaceae	*Habenaria bicolor*	NT	-	NT1	Protected	-	-	-	geophyte; herb
Orchidaceae	*Eulophia ovalis bainesii*	LC	-	-	Protected	-	-	-	geophyte; herb
Orchidaceae	*Eulophia hians nutans*	LC	-	-	Protected	-	-	-	geophyte; herb
Orchidaceae	*Eulophia hians hians*	LC	-	-	Protected	-	-	-	geophyte; herb
Orobanchaceae	*Cycnium tubulosum tubulosum*	LC	-	-	-	-	-	-	herb
Orobanchaceae	*Striga bilabiata bilabiata*	LC	-	-	-	-	-	-	parasite; herb
Orobanchaceae	*Buchnera reducta*	LC	-	-	-	-	-	-	parasite; herb
Orobanchaceae	*Sopubia cana cana*	LC	-	-	-	-	-	-	parasite; herb
Orobanchaceae	*Harveya speciosa*	LC	-	-	-	-	-	-	parasite; herb
Orobanchaceae	*Striga gesnerioides*	LC	-	-	-	-	-	-	parasite; herb
Oxalidaceae	*Oxalis corniculata*		-	-	-	-	-	-	herb
Oxalidaceae	*Oxalis obliquifolia*	LC	-	-	-	-	-	-	geophyte
Papaveraceae	*Papaver aculeatum*	LC	-	-	-	-	-	-	herb
Phrymaceae	*Mimulus gracilis*	LC	-	-	-	-	-	-	helophyte;

									hydrophyte; herb
Plantaginaceae	*Plantago lanceolata*	LC	-	-	-	-	-	-	herb
Plantaginaceae	*Plantago major*		-	-	-	-	-	-	herb
Poaceae	*Paspalum distichum*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Eragrostis curvula*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Brachiaria eruciformis*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Microchloa caffra*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Digitaria sp.*		-	-	-	-	-	-	graminoid
Poaceae	*Eragrostis tef*	NE	-	-	-	-	-	-	graminoid
Poaceae	*Sporobolus pectinatus*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Aristida congesta congesta*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Tristachya leucothrix*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Brachiaria serrata*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Digitaria tricholaenoides*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Eragrostis sclerantha sclerantha*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Tristachya rehmannii*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Poa annua*	NE	-	-	-	-	-	-	graminoid
Poaceae	*Ctenium concinnum*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Eragrostis chloromelas*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Panicum sp.*		-	-	-	-	-	-	graminoid
Poaceae	*Themeda triandra*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Agrostis eriantha eriantha*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Sporobolus sp.*		-	-	-	-	-	-	graminoid
Poaceae	*Bewsia biflora*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Polypogon monspeliensis*	NE	-	-	-	-	-	-	graminoid
Poaceae	*Sporobolus discosporus*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Arundinella nepalensis*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Stiburus conrathii*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Eragrostis stapfii*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Agrostis lachnantha lachnantha*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Cymbopogon caesius*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Imperata cylindrica*		-	-	-	-	-	-	graminoid
Poaceae	*Panicum stapfianum*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Bromus sp.*		-	-	-	-	-	-	graminoid
Poaceae	*Melinis nerviglumis*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Leersia hexandra*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Eragrostis cilianensis*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Eleusine multiflora*	NE	-	-	-	-	-	-	graminoid
Poaceae	*Alloteropsis semialata eckloniana*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Eragrostis capensis*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Lolium perenne*	NE	-	-	-	-	-	-	graminoid

Poaceae	*Melinis sp.*		-	-	-	-	-	-	graminoid
Poaceae	*Paspalum dilatatum*	NE	-	-	-	-	-	-	graminoid
Poaceae	*Setaria sphacelata torta*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Andropogon appendiculatus*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Phalaris arundinacea*	NE	-	-	-	-	-	-	graminoid
Poaceae	*Harpochloa falx*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Panicum natalense*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Chloris gayana*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Elionurus muticus*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Festuca scabra*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Helictotrichon turgidulum*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Eragrostis racemosa*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Leptochloa fusca*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Cynodon hirsutus*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Loudetia simplex*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Koeleria capensis*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Echinochloa jubata*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Digitaria monodactyla*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Calamagrostis epigejos capensis*	LC	-	-	-	-	-	-	graminoid
Poaceae	*Alloteropsis semialata semialata*	LC	-	-	-	-	-	-	graminoid
Polygalaceae	*Polygala gracilenta*	LC	-	-	-	-	-	-	herb
Polygalaceae	*Polygala transvaalensis transvaalensis*	LC	-	-	-	-	-	-	herb
Polygalaceae	*Polygala hottentotta*	LC	-	-	-	-	-	-	dwarf shrub; herb
Polygonaceae	*Rumex lanceolatus*	LC	-	-	-	-	-	-	herb
Polygonaceae	*Rumex acetosella angiocarpus*		-	-	-	-	-	-	herb
Polygonaceae	*Rumex crispus*		-	-	-	-	-	-	herb
Polygonaceae	*Emex australis*	LC	-	-	-	-	-	-	herb
Polygonaceae	*Oxygonum dregeanum canescens*	NE	-	-	-	-	-	-	herb
Potamogetonaceae	*Zannichellia palustris*	LC	-	-	-	-	-	-	hydrophyte; herb
Potamogetonaceae	*Potamogeton nodosus*	LC	-	-	-	-	-	-	Indigenous
Potamogetonaceae	*Potamogeton pectinatus*	LC	-	-	-	-	-	-	hydrophyte; herb
Pteridaceae	*Cheilanthes hirta hirta*	LC	-	-	Protected	-	-	-	lithophyte; geophyte; herb
Pteridaceae	*Cheilanthes viridis glauca*	LC	-	-	Protected	-	-	-	lithophyte; geophyte; herb
Pteridaceae	*Cheilanthes hirta brevipilosa*	LC	-	-	Protected	-	-	-	herb

Pteridaceae	*Pellaea calomelanos calomelanos*	LC	-	-	Protected	-	-	-	lithophyte; geophyte; herb
Ranunculaceae	*Ranunculus multifidus*	LC	-	-	-	-	-	-	herb
Rhamnaceae	*Ziziphus zeyheriana*	LC	-	-	-	-	-	-	dwarf shrub
Rhamnaceae	*Berchemia zeyheri*	LC	-	-	-	-	-	-	tree
Ricciaceae	*Riccia atropurpurea bryophyte;*		-	-	-	-	-	-	
Ricciaceae	*Riccia okahandjana bryophyte;*		-	-	-	-	-	-	
Rosaceae	*Rubus rigidus*	LC	-	-	-	-	-	-	shrub
Rubiaceae	*Richardia brasiliensis*	NE	-	-	-	-	-	-	herb
Rubiaceae	*Pentanisia angustifolia*	LC	-	-	-	-	-	-	herb
Rubiaceae	*Pachystigma pygmaeum*	LC	-	-	-	-	-	-	dwarf shrub
Rubiaceae	*Canthium inerme*	LC	-	-	-	-	-	-	tree; shrub
Rubiaceae	*Oldenlandia herbacea herbacea*	LC	-	-	-	-	-	-	herb; Indigenous
Rubiaceae	*Kohautia amatymbica*	LC	-	-	-	-	-	-	herb
Rubiaceae	*Bridsonia chamaedendrum*		-	-	-	-	-	-	
Rubiaceae	*Anthospermum rigidum pumilum*	LC	-	-	-	-	-	-	dwarf shrub
Ruscaceae	*Eriospermum flagelliforme*	LC	-	-	-	-	-	-	geophyte
Santalaceae	*Thesium goetzeanum*	LC	-	-	-	-	-	-	shrub; parasite; dwarf shrub
Santalaceae	*Thesium transvaalense*	LC	-	-	-	-	-	-	dwarf shrub; parasite; herb
Scrophulariaceae	*Chaenostoma neglectum*	LC	-	-	-	-	-	-	herb
Scrophulariaceae	*Limosella sp.*		-	-	-	-	-	-	
Scrophulariaceae	*Nemesia umbonata*	LC	-	-	-	-	-	-	herb
Scrophulariaceae	*Limosella maior*	LC	-	-	-	-	-	-	hydrophyte; herb
Scrophulariaceae	*Manulea paniculata*	LC	-	-	-	-	-	-	herb
Scrophulariaceae	*Jamesbrittenia aurantiaca*	LC	-	-	-	-	-	-	herb
Scrophulariaceae	*Selago sp.*		-	-	-	-	-	-	
Scrophulariaceae	*Nemesia sp.*		-	-	-	-	-	-	
Selaginellaceae	*Selaginella dregei*	LC	-	-	-	-	-	-	lithophyte; geophyte; herb
Solanaceae	*Withania somnifera*	LC	-	-	-	-	-	-	herb; dwarf shrub
Solanaceae	*Solanum capense*	LC	-	-	-	-	-	-	dwarf shrub; shrub
Solanaceae	*Solanum campylacanthum*		-	-	-	-	-	-	
Solanaceae	*Solanum sisymbriifolium*		-	-	-	-	1 weed	1b	herb; shrub
Solanaceae	*Solanum lichtensteinii*	LC	-	-	-	-	-	-	dwarf shrub; shrub
Thymelaeaceae	*Lasiosiphon microcephalus*		-	-	-	-	-	-	shrub; dwarf
Thymelaeaceae	*Gnidia nodiflora*	LC	-	-	-	-	-	-	shrub; dwarf

									shrub
Thymelaeaceae	*Lasiosiphon kraussianus*		-	-	-	-	-	-	
Thymelaeaceae	*Lasiosiphon canoargenteus*	LC	-	-	-	-	-	-	
Verbenaceae	*Chascanum hederaceum hederaceum*	LC	-	-	-	-	-	-	herb
Verbenaceae	*Glandularia aristigera*		-	-	-	-	-	-	
Xyridaceae	*Xyris capensis*	LC	-	-	-	-	-	-	helophyte; hydrophyte; herb

APPENDIX C: FLORAL SPECIES IDENTIFIED DURING SITE SURVEY

Number	Name	Common name	NEMBA	CARA	IUCN	TOPS 2013	GDARD 2014	TNCO 1983	Protected trees
1	*Verbena brasiliensis*	Brazilian vervain	1b	-	-	-	-	-	-
2	*Tagetes minuta*	Khaki bush	-	-	-	-	-	-	-
3	*Sida dregei*	Spider-leg	-	-	-	-	-	-	-
4	*Trifolium repens*	White clover	-	-	-	-	-	-	-
5	*Erigeron bonariensis*	Fleabane	-	-	-	-	-	-	-
6	*Eucalyptus camaldulensis*	River red gum	1b	2 Invader	-	-	-	-	-
7	*Bidens pilosa*	Black jack	-	-	-	-	-	-	-
8	*Melinis repens*	Natal Red Top	-	-	-	-	-	-	-
9	*Melia azedarach*	Syringa	3	3 Invader	-	-	-	-	-
10	*Acacia pycnantha*	Golden wattle	1b	1 Weed	-	-	-	-	-
11	*Solanum mauritianum*	Bugweed	1b	1 Weed	-	-	-	-	-
12	*Typha capensis*	Bullrush	-	-	-	-	-	-	-
13	*Cyperus spp*	Sedge	-	-	-	-	-	-	-
14	*Andropogon eucomis*	Snowflake grass	-	-	-	-	-	-	-
15	*Andropogon huillensis*	Large Silver Andropogon	-	-	-	-	-	-	-
16	*Schoenoplectus muricinux*		-	-	-	-	-	-	-
17	*Juncus effusus*	Soft Rush	-	-	-	-	-	-	-
19	*Helichrysum setosum*	Yellow everlasting	-	-	-	-	-	-	-
20	*Robinia pseudoacacia*	Black Locust Tree	1b	2 Invader *	-				
21	*Gomphocarpus fruticosus*	Milkweed	-	-	-	-	-	-	-
22	*Acacia decurrens*	Green wattle	2	2 Invader	-	-	-	-	-
23	*Sesbania punicea*	Red Sesbania	1b	1 Weed	-	-	-	-	-
24	*Morus spp*	Mulberry	3	Invader 3 *	-	-	-	-	-
25	*Populus x canescens*	Grey poplar	2	Invader 2	-	-	-	-	-
26	*Albizia spp*		1b	1 Weed	-	-	-	-	-
27	*Phragmites australis*	Cmmon reed	-	-	-	-	-	-	-
28	*Imperata cylindrica*	Cottonwool Grass	-	-	-	-	-	-	-
29	*Agrostis lachnantha*	Bent grass	-	-	-	-	-	-	-
31	*Beschorneria yuccoides*	Mexican lily	-	-	-	-	-	-	-
32	*Setaria sphacelata*	Common bristle grass	-	-	-	-	-	-	-
33	*Eragrostis curvula*	Weeping love grass	-	-	-	-	-	-	-
34	*Sporobolus stapfianus*	Fibrous dropseed	-	-	-	-	-	-	-
35	*Argemone mexicana*	Mexican poppy	1b	1 Weed	-	-	-	-	-

36	*Verbena rigida*	Veined verbena	1b	-	-	-	-	-	-
37	*Plantago lanceolata*	Ribwort	-	-	-	-	-	-	-
38	*Sonchus oleraceus*	Sow thistle	-	-	-	-	-	-	-
39	*Descurainia sophia*	Flixweed	-	-	-	-	-	-	-
40	*Cotula anthemoides*	Gansgras	-	-	-	-	-	-	-
41	*Helichrysum argyrosphaerum*	Poprosie	-	-	-	-	-	-	-
42	*Eragrostis chloromelas*	Curly leaf(narrow) love grass	-	-	-	-	-	-	-
43	*Pogonarthria squarrosa*	Herringbone grass	-	-	-	-	-	-	-
44	*Datura stramonium*	Common thorn apple	1b	1 Weed	-	-	-	-	-
45	*Acacia dealbata*	Silver wattle	2	2 Invader	-	-	-	-	-
46	*Sonchus wilmsii*	Milk thistle	-	-	-	-	-	-	-
48	*Dipcadi marlothii*		-	-	-	-	-	-	-
49	*Alcea rosa*	Hollyhock	-	-	-	-	-	-	-
50	*Plantago longissima*	Lamb's tongue	-	-	-	-	-	-	-
51	*Pennisetum clandestinum*	Kikuyu grass	1b *		-	-	-	-	-
52	*Cynodon dactylon*	Bermuda grass	-	-	-	-	-	-	-
53	*Araujia sericifera*	Moth catcher	1b	1 Weed	-	-	-	-	-
54	*Arundo donax*	Giant reed	1b	1 Weed	-	-	-	-	-
55	*Hyparrhenia hirta*	Common Thatching Grass	-	-	-	-	-	-	-

**Robinia pseudoacacia* is an invader with a category of two according to CARA with the exception if it is used as a rootstock authorised by the Executive Official in terms of regulation 15B(10)

**Morus* spp with the exception of the cultivar Pendula, and when used as rootstock authorised by the Executive Official in terms of regulation 15C(5)

**Pennnisetum clandestinum* is an invader only when found within wetlands where it is not already present

APPENDIX D:
FAUNA SPECIES LIST FOR 2628AB QDS

Table 16: Mammal species found in QDS 2628AB (MammalMAP)

Family	Scientific name	Common name	Red list category
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	Least Concern (2008)
Bovidae	*Antidorcas marsupialis*	Springbok	Least Concern (2016)
Bovidae	*Connochaetes gnou*	Black Wildebeest	Least Concern (2016)
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	Least Concern (2016)
Bovidae	*Kobus ellipsiprymnus*	Waterbuck	Least Concern (ver 3.1, 2016)
Bovidae	*Ourebia ourebi*	Oribi	Endangered
Bovidae	*Sylvicapra grimmia*	Bush Duiker	Least Concern (2016)
Bovidae	*Taurotragus oryx*	Common Eland	Least Concern (2016)
Cervidae	*Dama dama*	Fallow Deer	Introduced
Emballonuridae	*Taphozous (Taphozous) mauritianus*	Mauritian Tomb Bat	Least Concern
Equidae	*Equus quagga*	Plains Zebra	Least Concern (2016)
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)
Giraffidae	*Giraffa giraffa giraffa*	South African Giraffe	Least Concern (2016)
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern (2016)
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern (2016)
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	Least Concern (2016)
Muridae	*Mastomys coucha*	Southern African Mastomys	Least Concern (2016)
Muridae	*Otomys sp.*	Vlei Rats	
Muridae	*Otomys auratus*	Southern African Vlei Rat	Near Threatened (2016)
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	Least Concern (2016)
Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened (2016)
Nesomyidae	*Dendromus mystacalis*	Chestnut African Climbing Mouse	Least Concern (2016)
Nesomyidae	*Mystromys albicaudatus*	African White-tailed Rat	Vulnerable (2016)
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened (2016)
Thryonomyidae	*Thryonomys swinderianus*	Greater Cane Rat	Least Concern (2016)
Vespertilionidae	*Neoromicia capensis*	Cape Serotine	Least Concern (2016)

Table 17: Avifaunal species found in pentad (SABAP2)

Common Name	Scientific Name	Regional	Global
Avocet, Pied	*Recurvirostra avosetta*	LC	LC
Babbler, Arrow-marked	*Turdoides jardineii*	LC	LC
Barbet, Acacia Pied	*Tricholaema leucomelas*	LC	LC
Barbet, Black-collared	*Lybius torquatus*	LC	LC
Barbet, Crested	*Trachyphonus vaillantii*	LC	LC

Bee-eater, European	*Merops apiaster*	LC	LC
Bishop, Southern Red	*Euplectes orix*	LC	LC
Bishop, Yellow	*Euplectes capensis*	LC	LC
Bishop, Yellow-crowned	*Euplectes afer*	LC	LC
Bittern, Little	*Ixobrychus minutus*	LC	LC
Bokmakierie, Bokmakierie	*Telophorus zeylonus*	LC	LC
Boubou, Southern	*Laniarius ferrugineus*	LC	LC
Bulbul, African Red-eyed	*Pycnonotus nigricans*	LC	LC
Bulbul, Dark-capped	*Pycnonotus tricolor*	LC	LC
Buttonquail, Kurrichane	*Turnix sylvaticus*	LC	LC
Buzzard, Jackal	*Buteo rufofuscus*	LC	LC
Buzzard, Steppe	*Buteo vulpinus*	LC	LC
Canary, Black-throated	*Crithagra atrogularis*	LC	LC
Canary, Yellow	*Crithagra flaviventris*	LC	LC
Canary, Yellow-fronted	*Crithagra mozambicus*	LC	LC
Chat, Familiar	*Cercomela familiaris*	LC	LC
Cisticola, Cloud	*Cisticola textrix*	LC	LC
Cisticola, Desert	*Cisticola aridulus*	LC	LC
Cisticola, Levaillant's	*Cisticola tinniens*	LC	LC
Cisticola, Wailing	*Cisticola lais*	LC	LC
Cisticola, Wing-snapping	*Cisticola ayresii*	LC	LC
Cisticola, Zitting	*Cisticola juncidis*	LC	LC
Cliff-swallow, South African	*Hirundo spilodera*	LC	LC
Coot, Red-knobbed	*Fulica cristata*	LC	LC
Cormorant, Reed	*Phalacrocorax africanus*	LC	LC
Cormorant, White-breasted	*Phalacrocorax carbo*	LC	LC
Coucal, Burchell's	*Centropus burchellii*	LC	LC
Courser, Temminck's	*Cursorius temminckii*	LC	LC
Crake, African	*Crecopsis egregia*	LC	LC
Crake, Black	*Amaurornis flavirostris*	LC	LC
Crake, Corn	*Crex crex*	LC	LC
Crow, Pied	*Corvus albus*	LC	LC
Cuckoo, African	*Cuculus gularis*	LC	LC
Cuckoo, Diderick	*Chrysococcyx caprius*	LC	LC
Cuckoo, Red-chested	*Cuculus solitarius*	LC	LC
Curlew, Eurasian	*Numenius arquata*	NT	NT

Darter, African	*Anhinga rufa*	LC	LC
Dove, Laughing	*Streptopelia senegalensis*	LC	LC
Dove, Namaqua	*Oena capensis*	LC	LC
Dove, Red-eyed	*Streptopelia semitorquata*	LC	LC
Dove, Rock	*Columba livia*	LC	LC
Duck, African Black	*Anas sparsa*	LC	LC
Duck, Domestic	*Anas platyrhynchos*	LC	LC
Duck, Fulvous	*Dendrocygna bicolor*	LC	LC
Duck, Hybrid	*Anas hybrid*	LC	LC
Duck, Hybrid Mallard	*Anas hybrid*	LC	LC
Duck, Knob-billed	*Sarkidiornis melanotos*	LC	LC
Duck, Maccoa	*Oxyura maccoa*	NT	VU
Duck, Mallard	*Anas platyrhynchos*	LC	LC
Duck, Muscovy	*Cairina moschata*	LC	LC
Duck, White-backed	*Thalassornis leuconotus*	LC	LC
Duck, White-faced	*Dendrocygna viduata*	LC	LC
Duck, Yellow-billed	*Anas undulata*	LC	LC
Eagle, Long-crested	*Lophaetus occipitalis*	LC	LC
Egret, Cattle	*Bubulcus ibis*	LC	LC
Egret, Great	*Egretta alba*	LC	LC
Egret, Little	*Egretta garzetta*	LC	LC
Egret, Yellow-billed	*Egretta intermedia*	LC	LC
Finch, Red-headed	*Amadina erythrocephala*	LC	LC
Firefinch, African	*Lagonosticta rubricata*	LC	LC
Fiscal, Common (Southern)	*Lanius collaris*	LC	LC
Fish-eagle, African	*Haliaeetus vocifer*	LC	LC
Flamingo, Greater	*Phoenicopterus ruber*	NT	LC
Flamingo, Lesser	*Phoenicopterus minor*	NT	NT
Flufftail, Red-chested	*Sarothrura rufa*	LC	LC
Flycatcher, Fairy	*Stenostira scita*	LC	LC
Flycatcher, Fiscal	*Sigelus silens*	LC	LC
Flycatcher, Spotted	*Muscicapa striata*	LC	LC
Go-away-bird, Grey	*Corythaixoides concolor*	LC	LC
Goose, Domestic	*Anser anser*	LC	LC
Goose, Egyptian	*Alopochen aegyptiacus*	LC	LC
Goose, Spur-winged	*Plectropterus gambensis*	LC	LC

Goshawk, Gabar	*Melierax gabar*	LC	LC
Grass-owl, African	*Tyto capensis*	VU	LC
Grebe, Black-necked	*Podiceps nigricollis*	LC	LC
Grebe, Great Crested	*Podiceps cristatus*	LC	LC
Grebe, Little	*Tachybaptus ruficollis*	LC	LC
Green-pigeon, African	*Treron calvus*	LC	LC
Greenshank, Common	*Tringa nebularia*	LC	LC
Guineafowl, Helmeted	*Numida meleagris*	LC	LC
Gull, Grey-headed	*Larus cirrocephalus*	LC	LC
Hamerkop, Hamerkop	*Scopus umbretta*	LC	LC
Harrier-Hawk, African	*Polyboroides typus*	LC	LC
Heron, Black	*Egretta ardesiaca*	LC	LC
Heron, Black-headed	*Ardea melanocephala*	LC	LC
Heron, Goliath	*Ardea goliath*	LC	LC
Heron, Green-backed	*Butorides striata*	LC	LC
Heron, Grey	*Ardea cinerea*	LC	LC
Heron, Purple	*Ardea purpurea*	LC	LC
Heron, Squacco	*Ardeola ralloides*	LC	LC
Honeyguide, Greater	*Indicator indicator*	LC	LC
Honeyguide, Lesser	*Indicator minor*	LC	LC
Hoopoe, African	*Upupa africana*	LC	LC
Ibis, African Sacred	*Threskiornis aethiopicus*	LC	LC
Ibis, Glossy	*Plegadis falcinellus*	LC	LC
Ibis, Hadeda	*Bostrychia hagedash*	LC	LC
Jacana, African	*Actophilornis africanus*	LC	LC
Kingfisher, Brown-hooded	*Halcyon albiventris*	LC	LC
Kingfisher, Giant	*Megaceryle maximus*	LC	LC
Kingfisher, Half-collared	*Alcedo semitorquata*	NT	LC
Kingfisher, Malachite	*Alcedo cristata*	LC	LC
Kingfisher, Pied	*Ceryle rudis*	LC	LC
Kingfisher, Woodland	*Halcyon senegalensis*	LC	LC
Kite, Black-shouldered	*Elanus caeruleus*	LC	LC
Kite, Yellow-billed	*Milvus aegyptius*	LC	LC
Korhaan, Northern Black	*Afrotis afraoides*	LC	LC
Lapwing, African Wattled	*Vanellus senegallus*	LC	LC
Lapwing, Blacksmith	*Vanellus armatus*	LC	LC

Lapwing, Crowned	*Vanellus coronatus*	LC	LC
Lark, Rufous-naped	*Mirafra africana*	LC	LC
Longclaw, Cape	*Macronyx capensis*	LC	LC
Martin, Brown-throated	*Riparia paludicola*	LC	LC
Martin, Rock	*Hirundo fuligula*	LC	LC
Martin, Sand	*Riparia riparia*	LC	LC
Masked-weaver, Lesser	*Ploceus intermedius*	LC	LC
Masked-weaver, Southern	*Ploceus velatus*	LC	LC
Moorhen, Common	*Gallinula chloropus*	LC	LC
Mousebird, Red-faced	*Urocolius indicus*	LC	LC
Mousebird, Speckled	*Colius striatus*	LC	LC
Myna, Common	*Acridotheres tristis*	LC	LC
Neddicky, Neddicky	*Cisticola fulvicapilla*	LC	LC
Night-Heron, Black-crowned	*Nycticorax nycticorax*	LC	LC
Nightjar, Freckled	*Caprimulgus tristigma*	LC	LC
Olive-pigeon, African	*Columba arquatrix*	LC	LC
Ostrich, Common	*Struthio camelus*	LC	LC
Owl, Barn	*Tyto alba*	LC	LC
Owl, Marsh	*Asio capensis*	LC	LC
Palm-swift, African	*Cypsiurus parvus*	LC	LC
Paradise-flycatcher, African	*Terpsiphone viridis*	LC	LC
Peacock, Common	*Pavo cristatus*	LC	LC
Pigeon, Speckled	*Columba guinea*	LC	LC
Pipit, African	*Anthus cinnamomeus*	LC	LC
Pipit, Buffy	*Anthus vaalensis*	LC	LC
Pipit, Nicholson's	*Anthus nicholsoni*	LC	LC
Pipit, Plain-backed	*Anthus leucophrys*	LC	LC
Plover, Three-banded	*Charadrius tricollaris*	LC	LC
Pochard, Red-crested	*Netta rufina*	LC	LC
Pochard, Southern	*Netta erythrophthalma*	LC	LC
Prinia, Black-chested	*Prinia flavicans*	LC	LC
Prinia, Tawny-flanked	*Prinia subflava*	LC	LC
Quailfinch, African	*Ortygospiza atricollis*	LC	LC
Quelea, Red-billed	*Quelea quelea*	LC	LC
Rail, African	*Rallus caerulescens*	LC	LC
Reed-warbler, African	*Acrocephalus baeticatus*	LC	LC

Reed-warbler, Great	*Acrocephalus arundinaceus*	LC	LC
Robin-chat, Cape	*Cossypha caffra*	LC	LC
Rock-thrush, Sentinel	*Monticola explorator*	LC	NT
Ruff, Ruff	*Philomachus pugnax*	LC	LC
Rush-warbler, Little	*Bradypterus baboecala*	LC	LC
Sandpiper, Common	*Actitis hypoleucos*	LC	LC
Sandpiper, Marsh	*Tringa stagnatilis*	LC	LC
Sandpiper, Wood	*Tringa glareola*	LC	LC
Secretarybird, Secretarybird	*Sagittarius serpentarius*	VU	VU
Seedeater, Streaky-headed	*Crithagra gularis*	LC	LC
Shelduck, South African	*Tadorna cana*	LC	LC
Shoveler, Cape	*Anas smithii*	LC	LC
Shrike, Crimson-breasted	*Laniarius atrococcineus*	LC	LC
Shrike, Lesser Grey	*Lanius minor*	LC	LC
Shrike, Red-backed	*Lanius collurio*	LC	LC
Snipe, African	*Gallinago nigripennis*	LC	LC
Sparrow, Cape	*Passer melanurus*	LC	LC
Sparrow, House	*Passer domesticus*	LC	LC
Sparrow, Southern Grey-headed	*Passer diffusus*	LC	LC
Sparrow-weaver, White-browed	*Plocepasser mahali*	LC	LC
Sparrowhawk, Little	*Accipiter minullus*	LC	LC
Sparrowhawk, Ovambo	*Accipiter ovampensis*	LC	LC
Spoonbill, African	*Platalea alba*	LC	LC
Spurfowl, Swainson's	*Pternistis swainsonii*	LC	LC
Starling, Cape Glossy	*Lamprotornis nitens*	LC	LC
Starling, Pied	*Spreo bicolor*	LC	LC
Starling, Red-winged	*Onychognathus morio*	LC	LC
Starling, Wattled	*Creatophora cinerea*	LC	LC
Stilt, Black-winged	*Himantopus himantopus*	LC	LC
Stint, Little	*Calidris minuta*	LC	LC
Stonechat, African	*Saxicola torquatus*	LC	LC
Stork, Abdim's	*Ciconia abdimii*	NT	LC
Stork, White	*Ciconia ciconia*	LC	LC
Stork, Yellow-billed	*Mycteria ibis*	EN	LC
Sunbird, Amethyst	*Chalcomitra amethystina*	LC	LC
Sunbird, White-bellied	*Cinnyris talatala*	LC	LC

Swallow, Barn	*Hirundo rustica*	LC	LC
Swallow, Greater Striped	*Hirundo cucullata*	LC	LC
Swallow, Lesser Striped	*Hirundo abyssinica*	LC	LC
Swallow, Pearl-breasted	*Hirundo dimidiata*	LC	LC
Swallow, White-throated	*Hirundo albigularis*	LC	LC
Swamp-warbler, Lesser	*Acrocephalus gracilirostris*	LC	LC
Swamphen, African Purple	*Porphyrio madagascariensis*	LC	LC
Swan, Black	*Cygnus atratus*	LC	LC
Swift, African Black	*Apus barbatus*	LC	LC
Swift, Common	*Apus apus*	LC	LC
Swift, Horus	*Apus horus*	LC	LC
Swift, Little	*Apus affinis*	LC	LC
Swift, White-rumped	*Apus caffer*	LC	LC
Teal, Cape	*Anas capensis*	LC	LC
Teal, Hottentot	*Anas hottentota*	LC	LC
Teal, Red-billed	*Anas erythrorhyncha*	LC	LC
Tern, Whiskered	*Chlidonias hybrida*	LC	LC
Tern, White-winged	*Chlidonias leucopterus*	LC	LC
Thick-knee, Spotted	*Burhinus capensis*	LC	LC
Thrush, Groundscraper	*Psophocichla litsipsirupa*	LC	LC
Thrush, Karoo	*Turdus smithi*	LC	LC
Thrush, Kurrichane	*Turdus libonyanus*	LC	LC
Turtle-dove, Cape	*Streptopelia capicola*	LC	LC
Wagtail, Cape	*Motacilla capensis*	LC	LC
Warbler, Garden	*Sylvia borin*	LC	LC
Warbler, Marsh	*Acrocephalus palustris*	LC	LC
Warbler, Sedge	*Acrocephalus schoenobaenus*	LC	LC
Warbler, Willow	*Phylloscopus trochilus*	LC	LC
Waxbill, Common	*Estrilda astrild*	LC	LC
Waxbill, Orange-breasted	*Amandava subflava*	LC	LC
Weaver, Cape	*Ploceus capensis*	LC	LC
Weaver, Thick-billed	*Amblyospiza albifrons*	LC	LC
Weaver, Village	*Ploceus cucullatus*	LC	LC
Wheatear, Capped	*Oenanthe pileata*	LC	LC
Wheatear, Mountain	*Oenanthe monticola*	LC	LC
White-eye, Cape	*Zosterops virens*	LC	LC

Whydah, Pin-tailed	*Vidua macroura*	LC	LC
Widowbird, Fan-tailed	*Euplectes axillaris*	LC	LC
Widowbird, Long-tailed	*Euplectes progne*	LC	LC
Widowbird, Red-collared	*Euplectes ardens*	LC	LC
Widowbird, White-winged	*Euplectes albonotatus*	LC	LC
Wood-hoopoe, Green	*Phoeniculus purpureus*	LC	LC
Woodpecker, Cardinal	*Dendropicos fuscescens*	LC	LC
Wryneck, Red-throated	*Jynx ruficollis*	LC	LC

Table 18: Butterfly species occurring in QDS

Family	Scientific name	Common name	Red list category
Choreutidae	*Tebenna micalis*	-	
Crambidae	*Achyra coelatalis*	-	Not listed
Crambidae	*Bocchoris inspersalis*	-	Not listed
Crambidae	*Diasemia monostigma*	-	Not listed
Crambidae	*Hellula undalis*	-	Not listed
Crambidae	*Marasmia trapezalis*	-	Not listed
Crambidae	*Nomophila noctuella*	-	Not listed
Crambidae	*Spoladea recurvalis*	-	Not listed
Elachistidae	*Ethmia circumdatella*	-	Not listed
Erebidae	*Achaea catella*	-	Not listed
Erebidae	*Achaea echo*	-	Not listed
Erebidae	*Anomis sp.*	-	
Erebidae	*Ceryx anthraciformis*	-	Not listed
Erebidae	*Cyligramma latona*	-	Not listed
Erebidae	*Dysgonia angularis*	-	Not listed
Erebidae	*Eublemma acarodes*	-	Not listed
Erebidae	*Eublemma anachoresis*	-	Not listed
Erebidae	*Eublemma ornatula*	-	Not listed
Erebidae	*Grammodes sp.*	-	
Erebidae	*Grammodes euclidioides euclidioides*	-	Not listed
Erebidae	*Grammodes exclusiva*	-	Not listed
Erebidae	*Grammodes stolida*	-	Not listed
Erebidae	*Radara vacillans*	-	Not listed

Erebidae	*Siccia caffra*	-	Not listed
Erebidae	*Utetheisa pulchella*	-	Not listed
Geometridae	*Rhodometra sacraria*	-	Not Threatened (NT) [not an IUCN category]
Geometridae	*Xanthorhoe exorista*	-	Not Threatened (NT) [not an IUCN category]
Hepialidae	*FAMILY HEPIALIDAE*	Unidentified HEPIALIDAE	
Hesperiidae	*Afrogegenes sp.*		
Hesperiidae	*Coeliades forestan forestan*	Striped policeman	Least Concern (SABCA 2013)
Hesperiidae	*Gegenes sp.*		
Hesperiidae	*Metisella meninx*	Marsh sylph	Least Concern (SABCA 2013)
Hesperiidae	*Spialia asterodia*	Star sandman	Least Concern (SABCA 2013)
Hesperiidae	*Spialia ferax*	Striped sandman	Least Concern (SABCA 2013)
Lasiocampidae	*Eutricha sp.*		
Limacodidae	*Latoia vivida*		Not listed
Lycaenidae	*Actizera lucida*	Rayed blue	Least Concern (SABCA 2013)
Lycaenidae	*Aloeides aranda*	Yellow russet	Least Concern (SABCA 2013)
Lycaenidae	*Aloeides henningi*	Hillside russet	Least Concern (SABCA 2013)
Lycaenidae	*Aloeides trimeni trimeni*	Brown russet	Least Concern (SABCA 2013)
Lycaenidae	*Anthene amarah amarah*	Black-striped ciliate blue	Least Concern (SABCA 2013)
Lycaenidae	*Anthene definita definita*	Steel-blue-ciliate blue	Least Concern (SABCA 2013)
Lycaenidae	*Axiocerses tjoane tjoane*	Eastern scarlet	Least Concern (SABCA 2013)
Lycaenidae	*Azanus jesous*	Topaz babul blue	Least Concern (SABCA 2013)
Lycaenidae	*Cacyreus marshalli*	Common geranium bronze	Least Concern (SABCA 2013)
Lycaenidae	*Chilades trochylus*	Grass jewel blue	Least Concern (SABCA 2013)
Lycaenidae	*Cupidopsis cissus cissus*	Meadow blue	Least Concern (SABCA 2013)
Lycaenidae	*Cupidopsis jobates jobates*	Tailed meadow blue	Least Concern (SABCA 2013)
Lycaenidae	*Eicochrysops messapus mahallakoaena*	Cupreous ash blue	Least Concern (SABCA 2013)
Lycaenidae	*Lampides boeticus*	Pea blue	Least Concern (SABCA 2013)
Lycaenidae	*Leptotes sp.*		
Lycaenidae	*Leptotes pirithous pirithous*	Common zebra blue	Least Concern (SABCA 2013)
Lycaenidae	*Lycaena clarki*	Eastern sorrel copper	Least Concern (SABCA 2013)
Lycaenidae	*Tarucus sybaris sybaris*	Dotted pierrot	Least Concern (SABCA 2013)
Lycaenidae	*Uranothauma nubifer nubifer*	Black heart	Least Concern (SABCA 2013)
Lycaenidae	*Zintha hintza hintza*	Hintza pierrot	Least Concern (SABCA 2013)
Lycaenidae	*Zizeeria knysna knysna*	African grass blue	Least Concern (SABCA 2013)
Lycaenidae	*Zizula hylax*	Tiny grass blue	Least Concern (SABCA 2013)
Noctuidae	*Brithys crini*	Amaryllis stalk borer	Not listed

Noctuidae	*Chrysodeixis acuta*	-	Not listed
Noctuidae	*Helicoverpa armigera armigera*	-	Not listed
Noctuidae	*Interdelta mediafricana*	-	Not listed
Noctuidae	*Ozarba sp.*	-	
Noctuidae	*Plusia chalcedona*	-	Not listed
Noctuidae	*Syngrapha circumflexa*	-	Not listed
Noctuidae	*Trichoplusia orichalcea*	-	Not listed
Nymphalidae	*Acraea horta*	Garden acraea	Least Concern (SABCA 2013)
Nymphalidae	*Acraea neobule neobule*	Wandering donkey acraea	Least Concern (SABCA 2013)
Nymphalidae	*Byblia ilithyia*	Spotted joker	Least Concern (SABCA 2013)
Nymphalidae	*Catacroptera cloanthe cloanthe*	Pirate	Least Concern (SABCA 2013)
Nymphalidae	*Charaxes saturnus saturnus*	Foxy charaxes	Least Concern (SABCA 2013)
Nymphalidae	*Danaus chrysippus orientis*	African plain tiger	Least Concern (SABCA 2013)
Nymphalidae	*Hypolimnas misippus*	Common diadem	Least Concern (SABCA 2013)
Nymphalidae	*Junonia hierta cebrene*	Yellow pansy	Least Concern (SABCA 2013)
Nymphalidae	*Junonia oenone oenone*	Dark blue pansy	Least Concern (SABCA 2013)
Nymphalidae	*Junonia orithya madagascariensis*	African blue pansy	Least Concern (SABCA 2013)
Nymphalidae	*Phalanta phalantha aethiopica*	African leopard	Least Concern (SABCA 2013)
Nymphalidae	*Precis archesia archesia*	Garden inspector	Least Concern (SABCA 2013)
Nymphalidae	*Precis octavia sesamus*	Southern gaudy commodore	Least Concern (SABCA 2013)
Nymphalidae	*Telchinia cabira*	Yellow-banded telchinia	Least Concern (SABCA 2013)
Nymphalidae	*Telchinia rahira rahira*	Marsh telchinia	Least Concern (SABCA 2013)
Nymphalidae	*Telchinia serena*	Dancing telchinia	Least Concern (SABCA 2013)
Nymphalidae	*Vanessa cardui*	Painted lady	Least Concern (SABCA 2013)
Papilionidae	*Papilio demodocus demodocus*	Citrus swallowtail	Least Concern (SABCA 2013)
Papilionidae	*Papilio nireus lyaeus*	Narrow green-banded swallowtail	Least Concern (SABCA 2013)
Pieridae	*Belenois aurota*	Pioneer caper white	Least Concern (SABCA 2013)
Pieridae	*Belenois creona severina*	African caper white	Least Concern (SABCA 2013)
Pieridae	*Catopsilia florella*	African migrant	Least Concern (SABCA 2013)
Pieridae	*Colias electo electo*	African clouded yellow	Least Concern (SABCA 2013)
Pieridae	*Colotis annae annae*	Scarlet tip	Least Concern (SABCA 2013)
Pieridae	*Colotis vesta argillaceus*	Southern veined arab	Least Concern (SABCA 2013)
Pieridae	*Eurema brigitta brigitta*	Broad-bordered grass yellow	Least Concern (SABCA 2013)
Pieridae	*Mylothris agathina agathina*	Eastern dotted border	Least Concern (SABCA 2013)
Pieridae	*Mylothris rueppellii haemus*	Twin dotted border	Least Concern (SABCA 2013)
Pieridae	*Pinacopteryx eriphia eriphia*	Zebra white	Least Concern (SABCA 2013)

Pieridae	*Pontia helice helice*	Southern meadow white	Least Concern (SABCA 2013)
Pterophoridae	*FAMILY PTEROPHORIDAE*	Unidentified PTEROPHORIDAE	
Sphingidae	*Acherontia atropos*	-	Not listed
Sphingidae	*Basiothia medea*	-	Not listed
Sphingidae	*Nephele comma*	-	Not listed
Sphingidae	*Pseudoclanis postica*	-	Not listed

Table 19: Reptile species possibly occurring in QDS

Family	Scientific name	Common name	Red list category
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern (SARCA 2014)
Elapidae	*Elapsoidea sundevallii media*	Highveld Garter Snake	
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern (SARCA 2014)
Gekkonidae	*Lygodactylus capensis*	Common Dwarf Gecko	Least Concern (SARCA 2014)
Lacertidae	*Nucras lalandii*	Delalande's Sandveld Lizard	Least Concern (SARCA 2014)
Lamprophiidae	*Lamprophis aurora*	Aurora House Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern (SARCA 2014)
Leptotyphlopidae	*Leptotyphlops sp.*		
Pelomedusidae	*Pelomedusa galeata*	South African Marsh Terrapin	Not evaluated
Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern (SARCA 2014)
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern (SARCA 2014)

Table 20: Amphibian species found in 2628AB (FrogMAP)

Family	Scientific name	Common name	Red list category
Brevicepitidae	*Breviceps adspersus*	Bushveld Rain Frog	Least Concern
Bufonidae	*Schismaderma carens*	Red Toad	Least Concern
Bufonidae	*Sclerophrys garmani*	Olive Toad	Least Concern
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern (2017)
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern (2013)

Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bull Frog	Near Threatened
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern

Table 21: Other Invertebrate records as per QDS

Family	Scientific name	Common name	Red list category
Dungbeetles			
Scarabaeidae	*Onitis picticollis*	-	-
Scarabaeidae	*Onthophagus deterrens*	-	-
Lacewing			
Chrysopidae	FAMILY Chrysopidae	Unidentified Chrysopidae	-
Chrysopidae	*Chrysoperla sp.*	-	-
Chrysopidae	*Chrysoperla congrua*	-	-
Chrysopidae	*Dichochrysa gunvorae*	-	-
Chrysopidae	*Dysochrysa furcata*	-	-
Chrysopidae	*Italochrysa impar*	-	-
Coniopterygidae	FAMILY Coniopterygidae	Unidentified Coniopterygidae	-
Odonata			
Aeshnidae	*Anax ephippiger*	Vagrant Emperor	LC
Aeshnidae	*Anax imperator*	Blue Emperor	LC
Coenagrionidae	*Africallagma glaucum*	Swamp Bluet	LC
Coenagrionidae	*Azuragrion nigridorsum*	Sailing Bluet	LC
Coenagrionidae	*Ceriagrion glabrum*	Common Citril	LC
Coenagrionidae	*Ischnura senegalensis*	Tropical Bluetail	LC
Coenagrionidae	*Pseudagrion sp.*	-	-
Coenagrionidae	*Pseudagrion citricola*	Yellow-faced Sprite	LC
Coenagrionidae	*Pseudagrion massaicum*	Masai Sprite	LC
Coenagrionidae	*Pseudagrion salisburyense*	Slate Sprite	LC
Coenagrionidae	*Pseudagrion* (A–group) *sp.*	-	-
Lestidae	*Lestes pallidus*	Pallid Spreadwing	LC
Libellulidae	*Brachythemis leucosticta*	Southern Banded Groundling	LC
Libellulidae	*Crocothemis erythraea*	Broad Scarlet	LC
Libellulidae	*Diplacodes lefebvrii*	Black Percher	LC
Libellulidae	*Orthetrum sp.*	-	-
Libellulidae	*Orthetrum caffrum*	Two-striped Skimmer	LC
Libellulidae	*Orthetrum julia*	Julia Skimmer	LC
Libellulidae	*Orthetrum trinacria*	Long Skimmer	LC
Libellulidae	*Rhyothemis semihyalina*	Phantom Flutterer	LC
Libellulidae	*Sympetrum fonscolombii*	Red-veined Darter or Nomad	LC

Libellulidae	*Trithemis sp.*		
Libellulidae	*Trithemis dorsalis*	Highland Dropwing	LC
Libellulidae	*Trithemis kirbyi*	Orange-winged Dropwing	LC
Libellulidae	*Trithemis stictica*	Jaunty Dropwing	LC
Libellulidae	*Urothemis edwardsii*	Blue Basker	LC
Scorpions			
Buthidae	*Uroplectes triangulifer*	-	-
Scorpionidae	*Opistophthalmus pugnax*	-	-
Spiders			
Aranaeidae	*Nephila senegalensis*	Banded-legged golden orb-web spider	-
Araneidae	*Kilima decens*	kilima grass orb-web spiders	-
Corinnidae	FAMILY Corinnidae	Dark sac spiders and ant-imitating sac spiders	-
Lycosidae	FAMILY Lycosidae	Wolf spiders	-
Lycosidae	*Hippasa sp.*	Funnel-web wolf spiders	-
Lycosidae	*Pirata sp.*	Water wolf spiders	-
Mimetidae	FAMILY Mimetidae	Pirate spiders	-
Philodromidae	*Thanatus sp.*	running spiders	-
Pholcidae	FAMILY Pholcidae	Daddy longlegs spiders	-
Salticidae	*Heliophanus sp.*	jumping spiders	-
Sparassidae	*Palystes sp.*	Rain spiders	-
Theraphosidae	FAMILY Theraphosidae	Unidentified Theraphosidae	-
Theraphosidae	*Brachionopus sp.*		-
Theraphosidae	*Harpactira hamiltoni*		-
Thomisidae	*Oxytate sp.*	crab spiders	-
Thomisidae	*Thomisus sp.*	Flower crab spiders	-
Trochanteriidae	*Platyoides sp.*	scorpion spiders	-

APPENDIX G.3

Dr Andries Gouws & Prof Leslie Brown

Specialist Wetland Delineation And Assessment Report

BRENTWOOD: PORTION 440 AND 488 WETLAND STUDY

Ver 1

OCTOBER 2020 (REV 1)

PREPARED BY: Dr Andries Gouws, Prof Leslie Brown

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TABLE OF CONTENTS

1 DECLARATION

The observations, conclusions and recommendations made in this report are based on the best available data and on best scientific and professional knowledge. The report is based on GIS programming and utilises satellite tracking to map survey points. Survey points are normally accurate to within 3 metres; which must be considered in the use of the information.

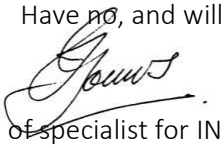
The directors of INDEX (Pty) Ltd exercises due care and diligence in rendering services and preparing documents. However, the company accepts no liability, and the client, by receiving this document, indemnifies INDEX (Pty) Ltd and its directors and employees, by the use of the information contained in this document, against any action, claim, demand, loss, liability, cost, damage and expense arising from or in connection with services rendered.

The property and copyright of this report shall remain vested in INDEX (Pty) Ltd. The client that commissioned the report may use the information as it may think fit; but only for the land for which it was commissioned.

Dr Andries Gouws of INDEX (Pty) LTD conducted the survey. He is a registered member of SACNASP (Registration Number 400140/06) and is a registered member of the South African Soil Science Society.

General declaration:

- INDEX acted as the independent specialist in this application;
- Perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- There were no circumstances that may compromise INDEX's objectivity in performing such work;
- INDEX have expertise in conducting the specialist report relevant to this application, including knowledge of NEMA and its regulations and any guidelines that have relevance to the proposed activity;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity.



Signature of specialist for INDEX

October 2020.

2 BACKGROUND

Index was requested to undertake a wetland assessment for a proposed township establishment for Portion 1 of the farm Witfontein 16-IR, district of Kempton Park.

The property is located on the corner of Celia Nestadt (M45) and Great North Road (R23), Brentwood Extension 3, also known as Benoni North Agricultural Holdings, Ekurhuleni Local Municipality. The site covers approximately 6.21 ha. Approximate centre coordinates are S 26° 8'20.72" and E 28°17'50.42".

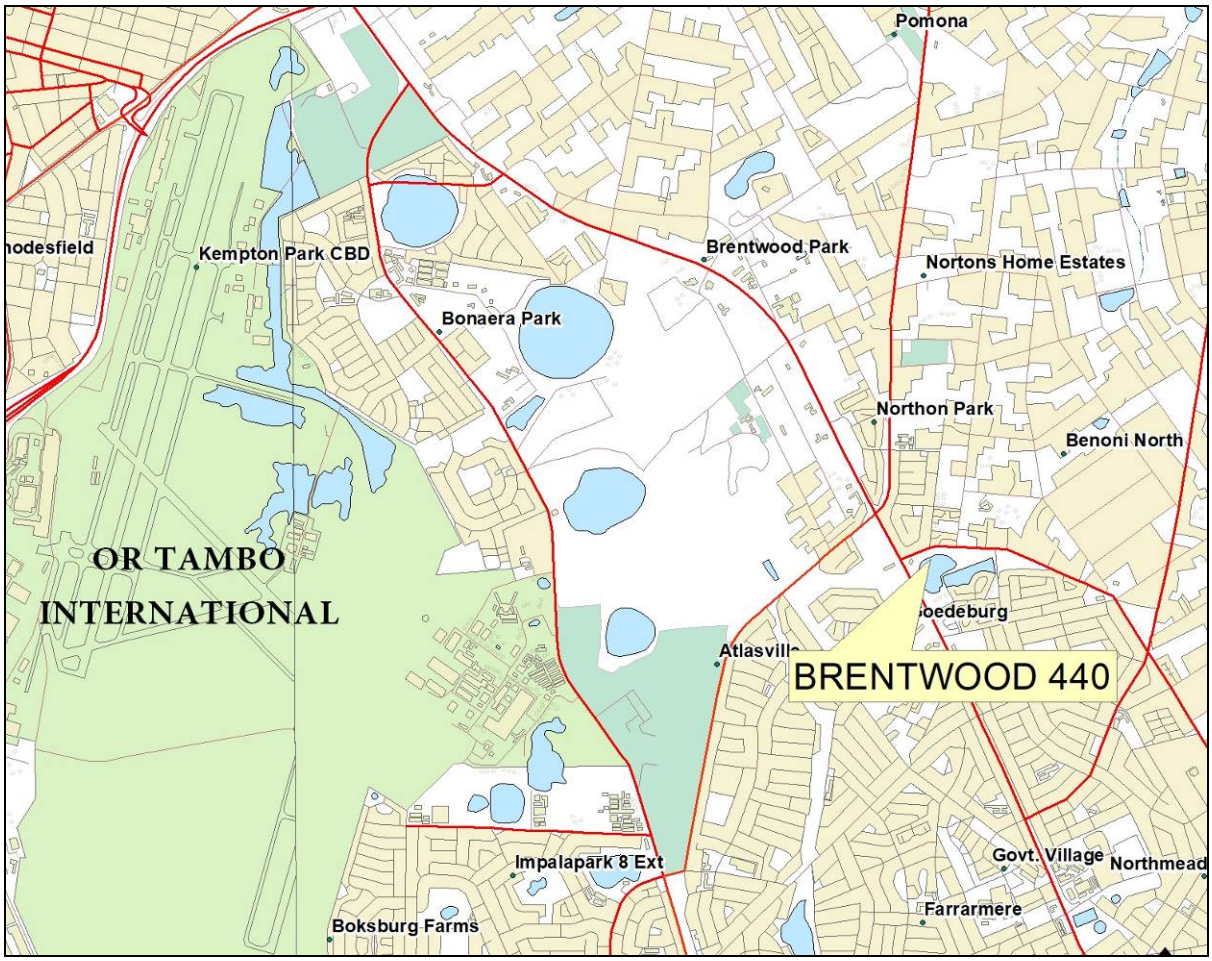


Figure 1. Locality of the site

Attribute	
Location	Lat/Lon: 26.13978906° S, 28.29761914° E
City/town	Kempton Park
Property size (affected property)	5,84 ha
Wetland size	1,89 hectares
Length of watercourse	204 metres

The process followed for the riparian / wetland delineation and assessment according to the methodology as contained in the Department of Water Affairs and Forestry, 2005 publication: A Practical Field Procedure for Delineation of Wetlands and Riparian Areas

The report conforms to the requirements of the Department of Water and Sanitation, and includes the following:

- Brief description of the natural environment that has an impact on wetland formation;
- Discussion of aspects determining wetland formation;
- Wetland delineation;
- Present ecological status of the wetland;
- Impact assessment;
- Conclusions and findings.

3 LEGISLATION

3.1 NATIONAL WATER ACT, 1998

In the National Water Act, a wetland is described as 'land which is transitional between terrestrial and aquatic systems where the water table is at, or near the surface; or the land that is periodically covered with shallow water, and which in normal circumstances supports, or would support vegetation typically adapted to life in saturated soil.'

Riparian zones are described as '*the physical structure and associated vegetation of the areas associated with a watercourse which is commonly characterised by alluvial soils, and which is inundated or flooded with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas*.'

The following is quoted from the Department of Water Affairs: Wetland delineation guidelines (2005), and is a description of hydromorphic soils:

'*A hydromorphic soil displays unique characteristics resulting from its prolonged and repeated saturation. A fluctuating water table, common in wetlands that are seasonally or temporarily saturated, results in alternation between aerobic and anaerobic conditions in the soil. Lowering of the water table results in a switch from anaerobic to aerobic soil conditions, causing dissolved iron to return to an insoluble state and be deposited in the form of patches or mottles in the soil. Recurrence of this cycle of wetting and drying over many decades concentrates these bright, insoluble iron compounds*.'

The National Water Act (Act) (Act 36 of 1998) recognises that the entire ecosystem and not just the water itself. The water resource and surrounding areas must be considered and constitutes the resource. No activity may therefore take place within a freshwater resource unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is excluded from development unless authorisation is obtained from the DWS in terms of Sections 21 of the Act.

General Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the NWA (Act 36 of 1998)

In accordance with GN 509 of 2016, a regulated area of a watercourse for Section 21(c) and 21(i) of the NWA, 1998 is defined as:

- the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
- in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or
- a 500 m buffer from the delineated boundary (extent) of any wetland or pan (regulated area).

This notice should be read together with the Risk Assessment provisions in the General Authorisation Notice in Relation to Section 21. The provisions of Section 21 that apply are:

- Section 21(c): Impeding or diverting the flow of water in a watercourse
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

3.2 BUFFERS

Buffer recommendation of DWS

In terms of legislation, wetlands and riparian zones are defined in the Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998).

Although a distance of the buffer is not fixed in legislation, the distance of at least 32 metres are recommended. DWA developed a tool to calculate the buffer, it should be determined by the Buffer tool[1].

Buffers as per GDARD guidelines

The Minimum Requirements for Biodiversity Assessments, 2014 of the Gauteng Department of Agriculture and Rural Development (GDARD, 2014) state that different buffers must be applied to sites inside and outside the urban edge (Table 1).

Table 1. Buffer requirements as per GDARD, 2014

	Wetlands	Riparian areas
Inside urban edge	30 meters	32 meters
Outside urban edge	50 meters	100 meters

NEMA and Section 21 of the Water Act

In terms of NEMA's EIA Regulations and the National Water Act: The authorisation process must recognise the risk the activity posed to the wetland based on the relevant reports submitted to the regulator, including method statements; master layout plan that shows very clearly all water use activities in relation to:

[1] Buffer zone guidelines for wetlands, rivers and Estuaries. 2017. WRC Report TT715-1-17.

- All wetlands;
- Riparian areas and the 1:100 year flood line;
- The 500m radius from the boundary of a wetland, where applicable;

4 DESCRIPTION OF THE ENVIRONMENT

4.1 METHOD FOLLOWED FOR INVESTIGATION OF WETLAND

The procedure followed was as follows:

- The development site was flown by UAV equipped with an RGB camera. From the photo sequence an orthophoto was generated by photogrammetry. This photo and satellite images were used as backdrop for digitizing features;
- LIDAR data was used to develop a DTM and water flow paths, as well as contours;
- A soil survey was done in accordance with the Binomial Classification System for Southern Africa (Soil Classification Working Group, 1991, revised 2016). Initial delineation of the soil forms took into account the following: vegetation type, terrain form, colour and texture of the soil. The boundaries are then refined through soil auger and or soil probe;
- Soil form had clear and distinct boundaries because of the site's history of infill. These boundaries were delineated from earlier satellite images. Soil forms are then investigated in more detail. Vegetation composition was used as an indicator where wetland soils are likely to occur;

Figure 2. Situation in 2007/8

- Using the above information, the final boundary of the wetland was then delineated.
- Observations points are indicated in Figure 2 and photos provided as an addendum.

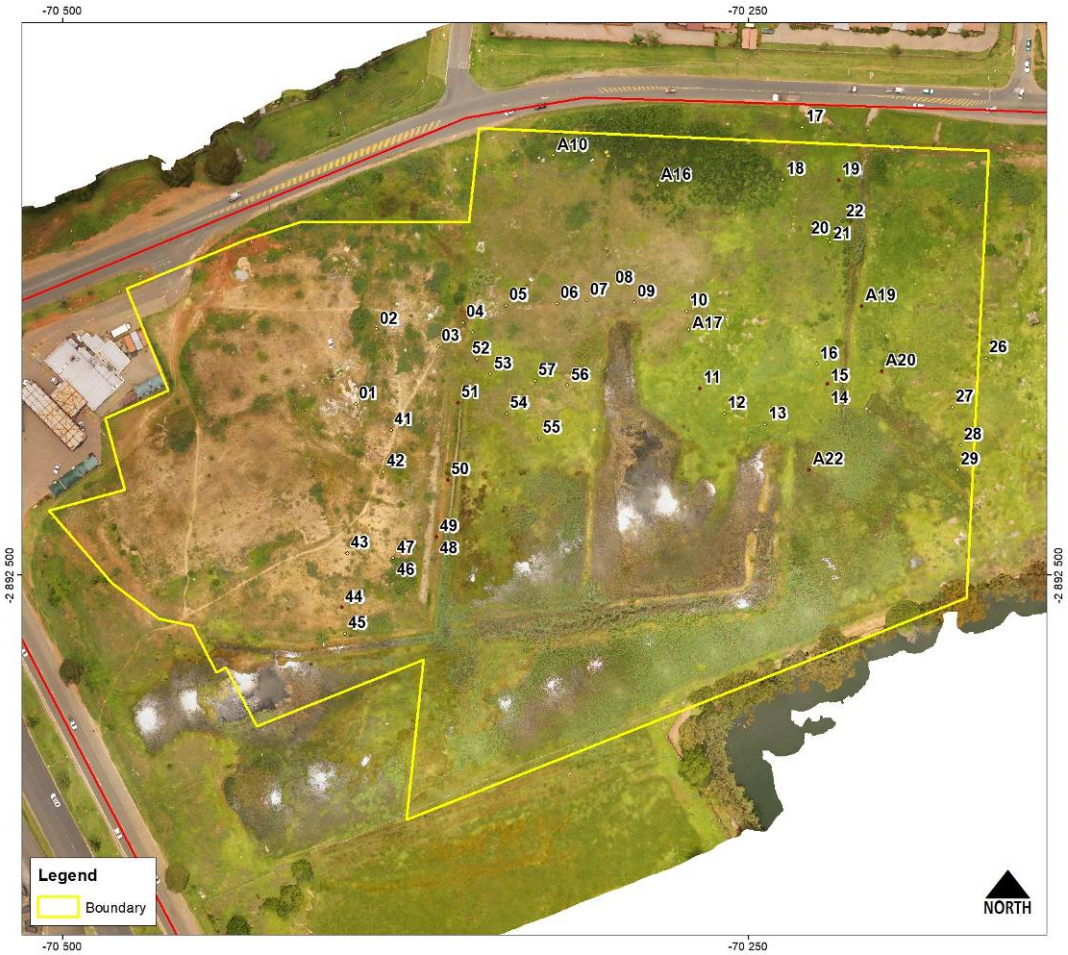


Figure 3. Position of observations made on the site

4.2 PRESENT LAND USE

The property is vacant and now used for illegal rubbish dumping.

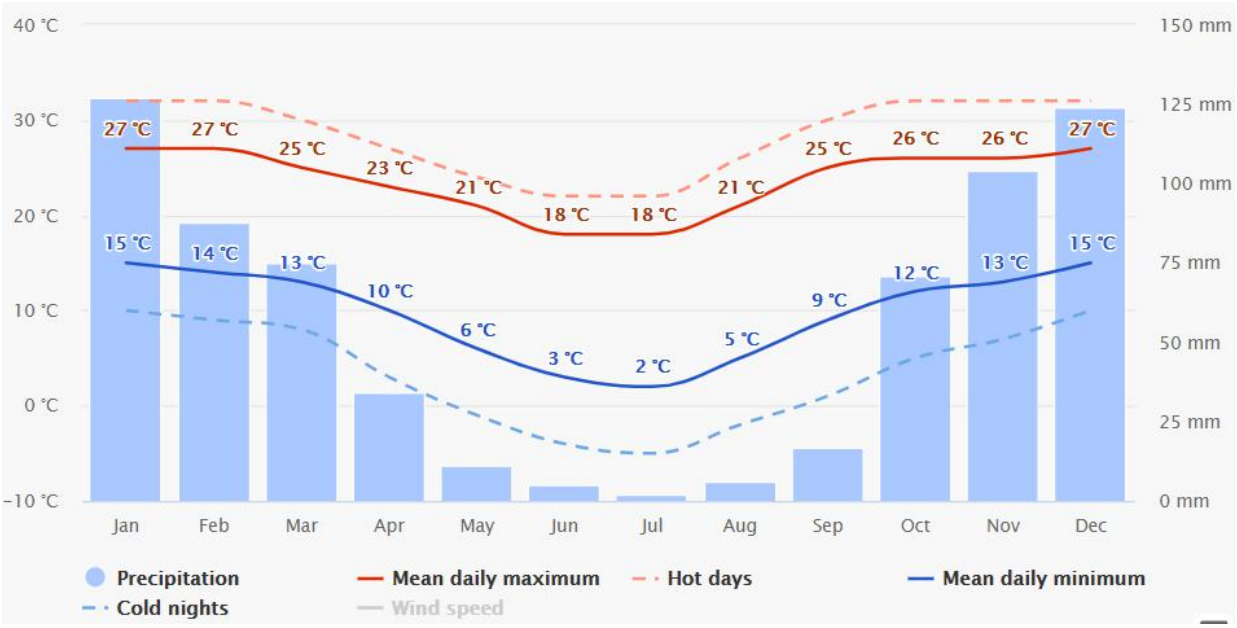
4.3 NATURAL RESOURCES

4.3.1 CLIMATE

Rainfall

- The rainfall is typical of the Highveld's summer rainfall pattern, where more than 80% falls from October through to April. An average of 715 mm rain is expected per year in the area, of which 585 mm is estimated as being available for vegetation.

Table 2 Average temperatures and rainfall



Temperature

- Average temp
  - The monthly maximum temperature reaches a peak of 26,2^{0}C in January and then steadily falls to 16,3^{0}C in July.
  - The summers are mild and maximum temperatures above 32^{0}C are not common.
- Minimum temperature
  - The average monthly minimum temperature is 4,0^{0}C in June and July, while the absolute minimum can reach -4^{0}C.
  - The area experiences severe frost, which occurs frequently from mid-April to as late as September.
  - Occurrence of frost has to be considered in crop selection.
- The summers are mild where temperatures above 30^{0}C are seldom reached.

Wind

- Wind with moderately high speeds occurs from late winter to early summer.
- Wind damage to trees is not expected.

Evaporation

- The evaporation at Kempton Park is according to Budyko's model is 1608mm/year. The maximum evaporation occurs in December when more than 148 mm for the month is lost.

4.3.2 TERRAIN MORPHOLOGY AND SOIL FORMATION

The site has a slope f less than 2% towards the watercourse. A section through the site that indicates the topography of site is indicated in Figure 3:

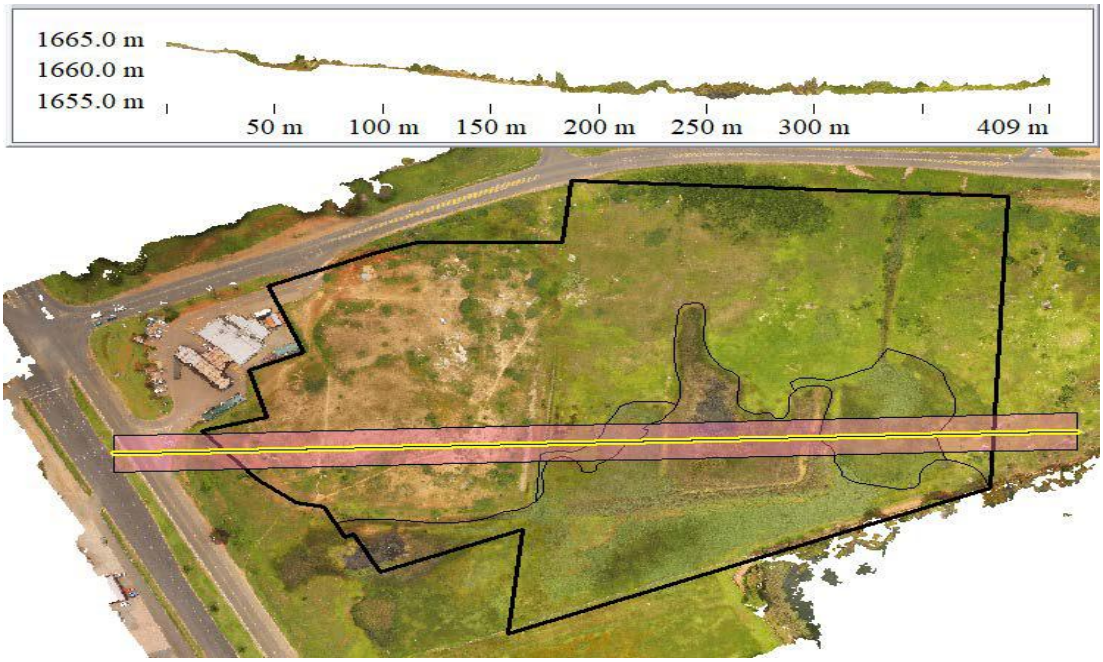


Figure 4, Morphology of the site

4.3.3 SOIL

The land was seriously transformed in 2007/8 when an attempt was made to develop the site for commercial purposes.

- Most of the site was infilled to build construction platforms. They are classified as Witbank.
- Rubble is strewn along the eastern boundary.
- The southern portion is water saturated and was classified as wetland.

The shallower portions of the infilled area have reverted to wetland conditions and due to the decomposition of plant material and the consequent organic layer is now Champaign soil form. It is, however under standing water and was therefore classified as wetland.

The observation locations are indicated in Figure 2 and photos of each is provided as an addendum. An example of each soil type is indicated below:

Photo 1. Wetland (WL on map)

Photo 2. Rubble

Photo 3. Witbank soil (WB on map)

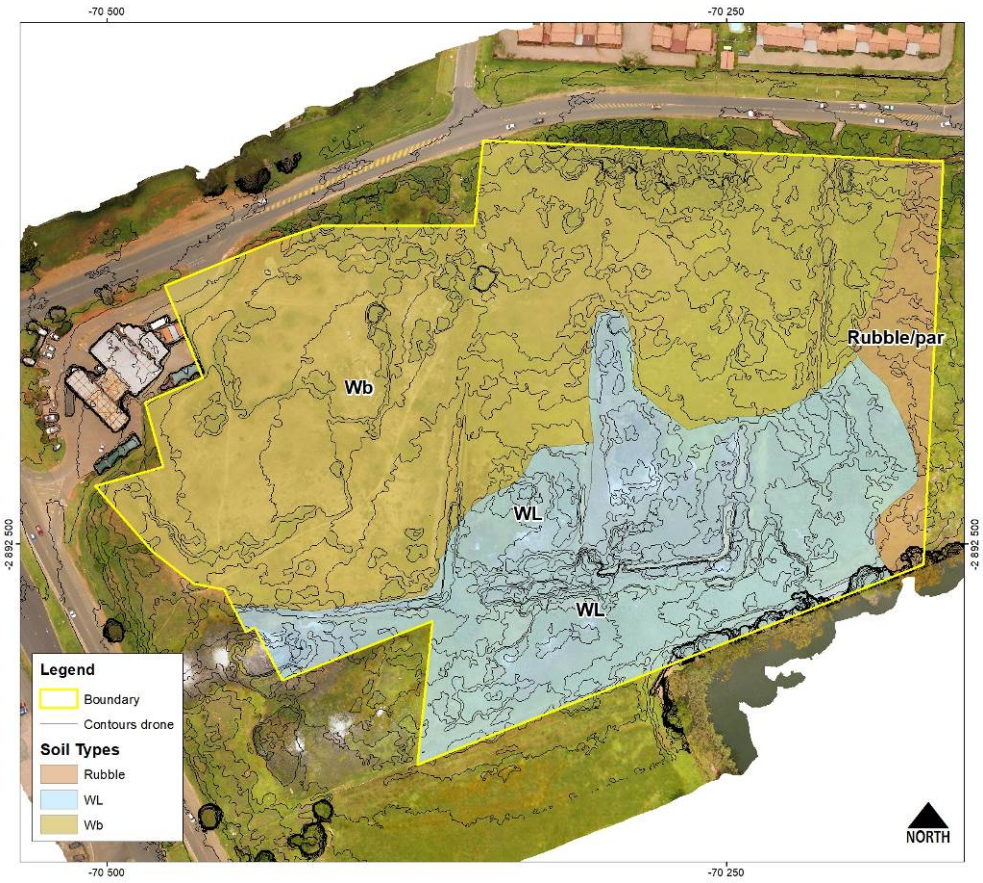


Figure 5. Soil map (WL=wetland; Wb=Witbank soil)

4.3.4 VEGETATION

Vegetation is normally a reflection of the soil conditions and is therefore an important visual method of finding areas where a wetland can occur. The morphological indicators in the soil are far more permanent than the vegetation and the soil can display signs of wetness long after a wetland had been drained. Also, vegetation will adapt rapidly at times when storm water causes water saturated conditions.

The trees observed within the wetland area consists mostly the invasive wattles, *Acacia decurrens* (Greenwattle), and *Acacia pycnantha* (Golden wattle) observed in dense stands within and around of the wetland area. Other trees observed in smaller numbers and less dense stands are *Melia azedarach* (Syringa), *Eucalyptus camaldulensis* (Red river gum), *Morus alba* (Mulberry) and *Populus x canescens* (Grey poplar).

The graminoid layer in and around the riparian area consists of dense stands of the *Typha capensis* (Bull rush) and the reed *Phragmites australis*. Sedge species observed were *Juncus effusus* (Soft rush) and *Schoenoplectus muricinux*. Other sedges were present but unidentifiable due to being burned down by a fire recently. The grass layer was dominated in areas by *Imperata cylindrica* (Cottonwool grass) and in other areas by the alien invasive *Pennisetum clandestinum* (Kikuyu) with *Andropogon* species also found in dense stands. Other grass species observed within the unit are *Agrostis lachnantha* (Bent grass), *Setaria sphacelata* (Common bristle grass) and *Eragrostis spp*. (See the Biodiversity impact assessment of Enviridi, 2020 for more details).

Observations for the soils and plants are provided in the addenda.

5 NFEPA WETLANDS

National Freshwater Ecosystem Priority Areas for South Africa (or the 'NFEPA project') is a tool developed in 2011 and is now under the administration of Working for Water of DWS to indicate "*wetland ecosystem types and wetland condition on a national scale. The delineations were based largely on remotely-sensed imagery and therefore did not include historic wetlands lost through drainage, ploughing and concreting*." (Extracted from SANBI GIS metadata.)

Because of the regional nature, the NFEPA dataset provides a general indication of the status of wetlands. According to the NFEPA classification the pan on the property is of significance. Within the development site, the wetland condition is graded as 'Z1' (heavily to critically modified).

Figure 6. NFEPA wetlands in the area

6 WETLAND DELINEATION

The (hydro-geomorphology) HGM classification was followed; this classification system is based on the position of a wetland in the landscape (geomorphic setting), dominant sources of water, and the flow and fluctuation of water once in the wetland. Units are indicated in the addenda.

Wetlands are defined by the National Water Act as '*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.*' Accordingly, a wetland must have one or more of the following attributes:

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

The objective of the delineation procedure is to identify the outer edge of the temporary zone. This outer edge marks the boundary between the wetland and adjacent terrestrial areas. Occurrence of standing water and hydrophilic plants and finally, soil conditions were used as the determinant for this assessment. In more detail, the following:

6.1 CRITERIA

Soil condition is the primary criterion that signifies waterlogged conditions. These conditions manifest itself through plant communities that can tolerate hydromorphic soils. These plants are hydrophytes that are adapted to stresses imposed on plants through temporary or permanent waterlogged conditions. Because of the disturbed nature and history of the site, credence was placed on the plant composition as boundary of the saturated zones.

The importance of retaining and maintaining functional wetlands are well established - the process of establishing the boundaries less so. The following criteria discussed in *A Practical Field Guide for the Identification and Delineation of Wetlands and Riparian Areas*, published by DWS are used as baseline information. Guidelines for the main indicators are the following:

Terrain morphology

Wetlands predominantly occur on valley bottoms and on seeps in other terrain forms.

Vegetation

Vegetation on site was used as a reflection of the soil conditions, but only used as a visual method of finding areas where wetlands may occur.

- Large proportion of hydrophytes; emergent plants: reeds, sedges, and floating or submerged aquatic plants indicate permanently saturated wetlands;
- Hydrophilic sedges and a variety of grass and hydrophilic woody plants are dominant on seasonally waterlogged soils;
- A variety of water tolerant grasses and woody species that may also occur on non-wetland areas can be indicative of temporarily waterlogged conditions.

Detail of the criteria is provided in the annexures.

Soils

Soils are the main determinant of wetland conditions. Redoximorphic features must be present within the upper 500 mm of the soil profile for an area to be considered a wetland. Redoximorphic features typically occur in three types:

- Matrix colour: *in situ* low chromas resulting from the absence of Fe^{3+} ions which are characterised by "grey" colours of the soil matrix.
- Depletion of Fe-Mn oxides or where both Fe-Mn oxides and clay have been stripped.
- Accumulation of iron and manganese oxides (also called mottles).

Qualifying colours, according to the Munsell colour chart are indicated in the annexures.

6.2 WETLAND BOUNDARIES

The soil identified consisted of soils belonging to the Champaign and Katspruit form. These soil types are recognised by the National Water Act (Department of Water and Sanitation) as being a possible wetland.

Water saturated portions could clearly be identified from the drone images. The boundaries were then confirmed in the field. Seasonally saturated soils were classified as seeps. The seep on the eastern portion is largely fed from the stormwater drain that enters the site from the northern boundary.

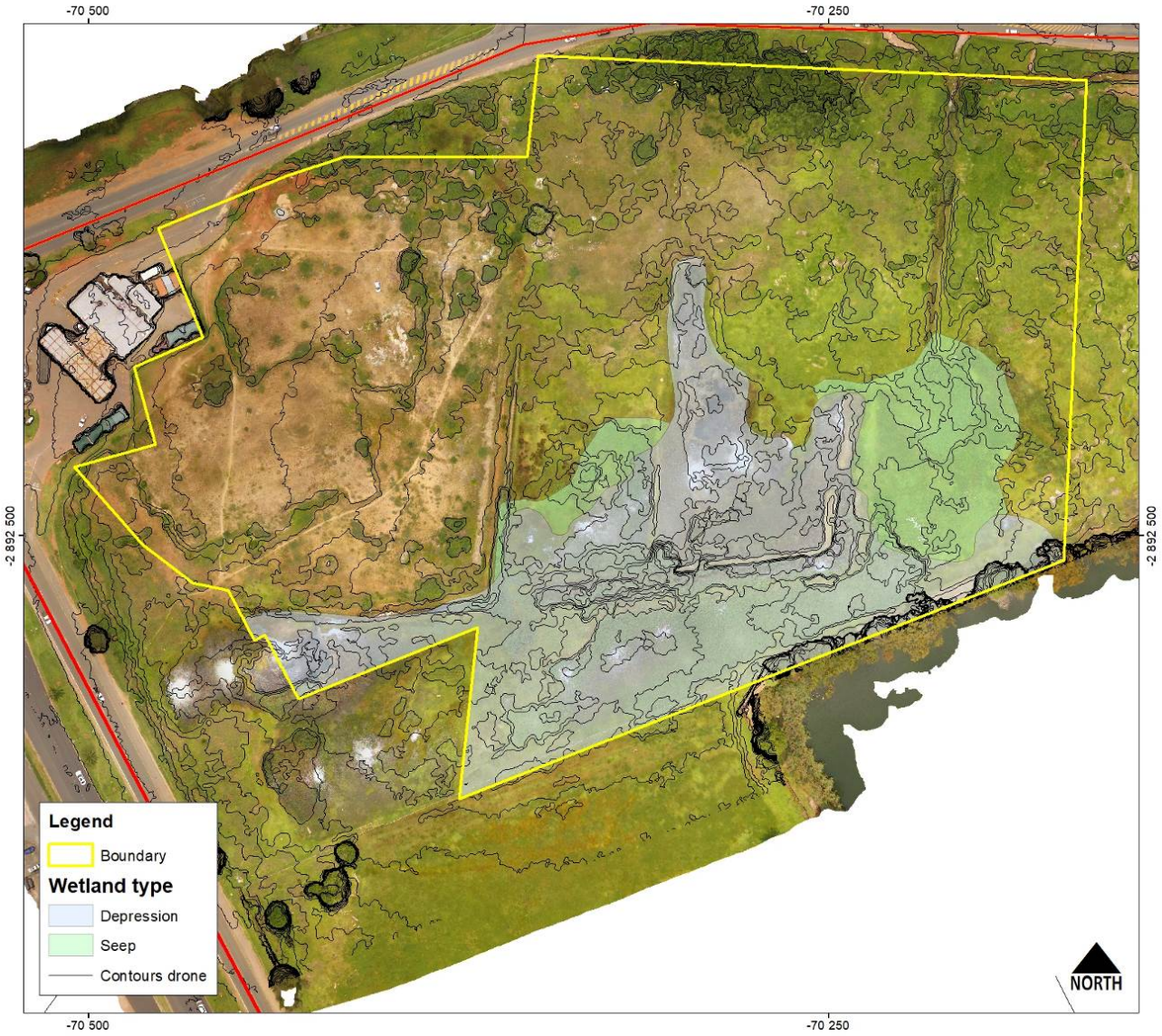


Figure 7. Wetlands on the development site

7 THE PRESENT ECOLOGICAL STATE (PES)

The PES at present and since 2007/8 is poor and highly transformed. It is however, functional in its present condition. The scoring system, as described in the document *"Resource Directed Measures for Protection of Water Resources, Volume 4 - Wetland Ecosystems" (DWS, 1999)*, was used for the determination of the PES.

The vegetation component of Wet-Health was considered relevant to the study site, and reflected an overall PES category of F.

This low score is mainly due to the large cleared patches, lack of indigenous species and relative abundance of alien and invasive plant species and presence of rubble.

The site was and still is used for dumping building rubble and household rubbish. Most of the north-eastern portion is overgrown with the alien invasive grass *Pennisetum clandestinum* and other shrubs (see the Terrestrial Biodiversity Report for a detailed assessment).

Table 3. Table explaining the scoring system used for the PES assessment

Mean	Category	Explanation
Within generally acceptable range		
>4	A	Unmodified, or approximates natural condition.
3 - 4	B	Largely natural with few modifications, some loss of natural habitats
2,5 - 2.9	C	Moderately modified, but with some loss of natural habitats
1,4 - 2,4	D	Largely modified. Large loss of natural habitat and basic ecosystem function has occurred.
Outside generally acceptable range		
0,1 - 1,3	E	Seriously modified. The loss of natural habitat and ecosystem functions are extensive
0	F	Critically modified. Modification has reached a critical level and the system has been modified completely with almost complete loss of natural habitat

The ecological state of the wetlands is F.

8 THE ECOLOGICAL IMPORTANCE AND SENSITIVITY

The EIS of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning at local and wider scales (DWAF 1999). It assesses ecological importance and sensitivity, hydro-functional importance, and direct human benefits (DWA, 2013). See table below for EIS classification scores.

Table 4. Ecological Importance and Sensitivity classes. (DWA 2013, p43)

Ecological Importance and Sensitivity Categories	Range of EIS Score	EIS Class
Very high: Wetlands that are considered ecologically important and sensitive on a national or international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water.	4	A
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quality and quantity of water in major rivers.	3-4	B
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major river.	2-3	C
Low/Marginal: Wetlands that is not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	1-2	D
None: Wetlands that is rarely sensitive to changes in water quality/hydrological regime.	0	E

Ecological importance is an expression of a wetland's importance to the maintenance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (DWAF, 1999). This classification of water resources allows for an appropriate management class to be allocated to the water resource and includes the following:

- Ecological Importance in terms of ecosystems and biodiversity;
- Ecological functions; and
- Basic human needs.

Table 5 indicates the EIS scores obtained for the section of the watercourse discussed in the current study. Table 6 provides an overview of the rating scale used with an explanation of the relative status of units in each category. Although the wetland is deemed not sensitive according to this methodology it remains a component of a non-renewable resource and as such is protected by various sections of legislation and local policies and should therefore be seen as sensitive in this context.

Table 5. EIS scores obtained for the wetland (DWAF, 1999)

WETLAND IMPORTANCE AND SENSITIVITY	Importance	Confidence
Ecological importance & sensitivity	1.2	***4.2***
Hydro-functional importance	0.6	***4.0***
Direct human benefits	0.3	***2.0***
Overall score	**0.7**	

Table 6. Environmental Importance and Sensitivity rating scale used for calculation of EIS scores (DWAF, 1999)

Ecological Importance and Sensitivity Categories	Rating	Recommended Management Class
Very High: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water in major rivers	3-4	A
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers	2-3	B
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers	1-2	C
Low/Marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water in major rivers	<1	D

9 GOODS AND SERVICES

Pans receive surface and groundwater flows, which accumulate due to impervious layers which prevents the water from draining away. The opportunity for attenuating floods is, limited due to its position in the landscape. However, they do capture runoff because of their inward draining nature, and thus they reduce the volume of surface water that would otherwise reach the stream system and contribute to high energy stormwater flows.

Large portions of the wetland the site have been lost due to infilling and compaction. Berms and ditches found on the site are evidence of attempts to drain or confine water from adjacent areas. There are surface drains on the northern portion of the site that deposits stormwater into the pan.

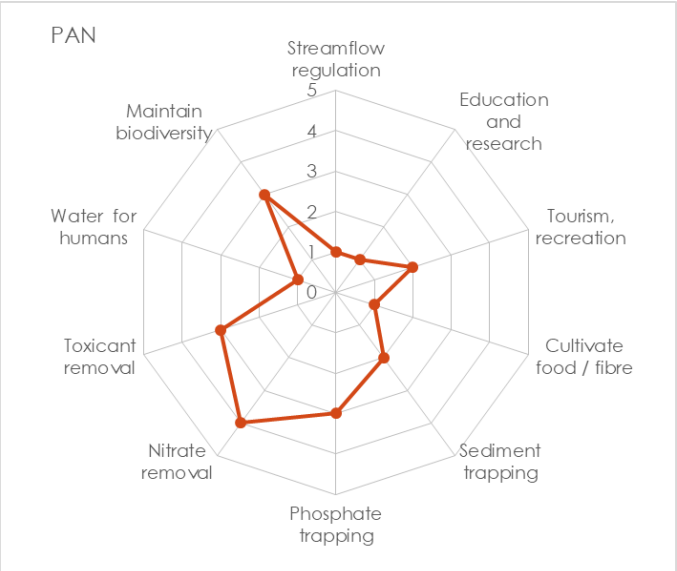


Figure 8. Ecological services provided by the wetland

A stormwater management plan done by JT IVOLVE calculated the volume of water that must be captured and attenuated. He concluded that there is sufficient volume in the pan to safely deal with runoff.

10 BUFFER ZONE

The prescribed buffers are as follows:

- The Water Act
  - The Buffer Tool calculated the buffer as a minimum of 15 metres (see Figure 10)

water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

BUFFER ZONE TOOL FOR THE DETERMINATION OF AC
AND ADDITIONAL SETBACK REQUIREMENTS FOR WE

Note: For further guidance on the application of this tool, users should refer to the preliminary guideline for the determination of buffer zones. It is also important to note that buffer widths calcu
therefore be defined to cater for other potential impacts. Finally, the buffer zone tool has been designe

Additional mitigation measures to consider	Y/N
Have additional mitigation measures been identified to cater for any point-source discharges?	N
Have additional mitigation measures been identified to cater for potential groundwater impacts?	N

Where necessary review and refine aquatic impact buffer requirements to cater for practical management considerations

	Buffer Segment 1	Buffer Segment 2
	Final aquatic impact buffer requirements (including practical manage	
Construction Phase	15	15
Operational Phase	15	15
Final aquatic impact buffer requirement	15	15
Rationale for any increases in final buffer requirements		

Figure 9. Results of the buffer tool calculation

- NEMA
  - In terms of NEMA's EIA Regulations any development within the 1:50 year floodline and 32 metres from the stream margin will trigger environmental authorisation in terms of NEMA
- Provincial: GDARD
  - The site falls within the development boundary (urban edge) of the Ekurhuleni Metro - a buffer of 30 metres is recommended.

Buffer determination

- Two buffers are indicated on Figure 9.
  - 30 metres from the wetland edge as recommended by GDARD, and
  - 15 metres as calculated by the Buffer Tool of DWS.

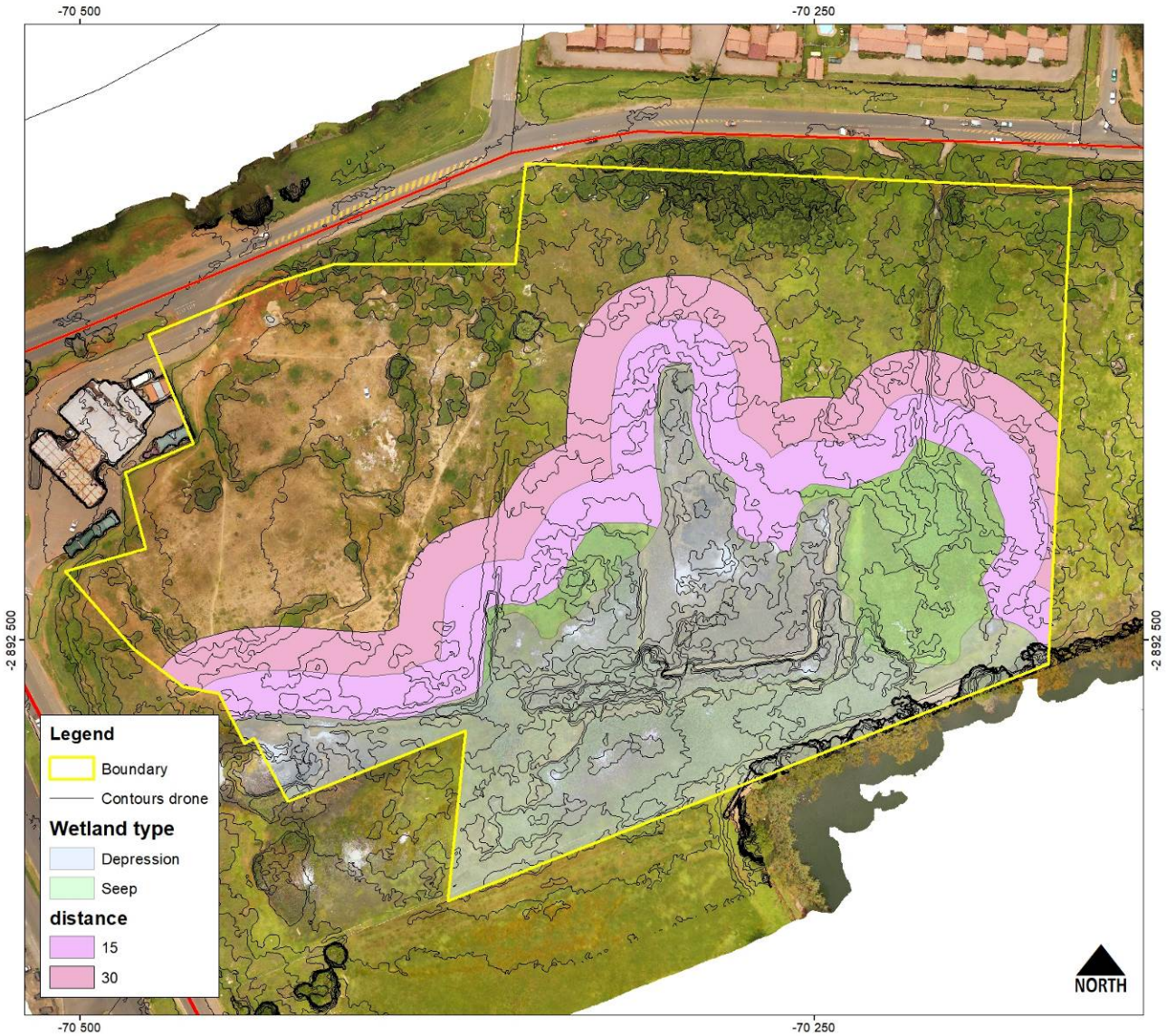


Figure 10. Wetland buffer

11 PROPOSED DEVELOPMENT

The proposed development is indicated in Figure 12.

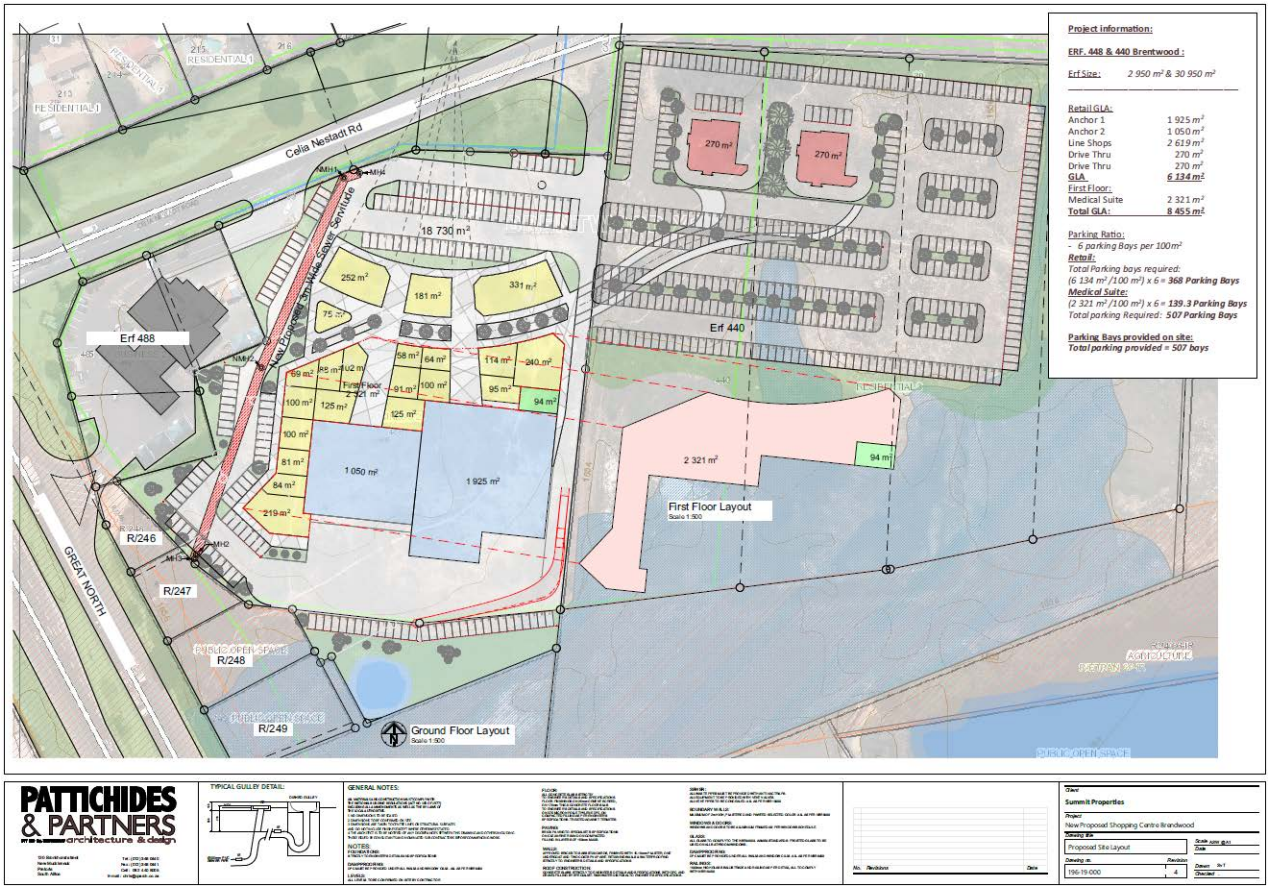


Figure 11. Development footprint and proposed services

12 IMPACT ASSESSMENT

Potential impact of the proposed development

Habitat loss

This implies the loss of plant and animal species which ultimately results in a loss of habitat and species diversity.

Description & mitigation

The terrestrial area as well as the identified buffer zone around the wetland area are transformed due to the infill of land with rubble and litter in the past that resulted in the establishment of pioneer weedy and alien invasive plant species. These areas have from a plant ecological and ecosystem functioning a **low conservation value**. It is therefore not foreseen that development of these areas would have any significant long-term negative effect on the environment. It is however, recommended that areas not to be developed such as the required buffer zone be landscaped and replanted with indigenous vegetation that would naturally occur in and around wetland buffer areas. For these purposes, a list of possible species should be prepared by the landscaper and provided to the ECO for approval. Examples of these include the grasses *Eragrostis curvula, Eragrostis plana, Imperata cylindrica, Cynodon dactylon, Pennisetum macrourum, Agrostis lachnantha, Arundinella nepalensis* and *Diplachne fusca*.

Removal of vegetation (except alien plant species) in the wetland will negatively affect the biota and ecosystem functioning of the wetland system. Wetlands are regarded as sensitive ecosystems with **high conservation value** due to the variety of ecosystem functions that they provide. Any development within the wetland will have a long-term negative effect on the environment. It is therefore recommended that no development is allowed within the wetland area. The wetland area and applicable buffer zone should be fenced off during development and no person allowed to enter other than for the removal of alien plant species.

Alien vegetation dispersion

Alien vegetation poses a huge risk to the natural environment and its ecosystem functioning. Not only do these plants use a large amount of water causing the drying out of ecosystems, but they also displace the natural vegetation leading to a loss in biodiversity and habitat.

Description & mitigation

A large number of alien vegetation (trees and weeds) are present on the site. If these plants are not properly controlled, the construction and proposed development can cause further spread of these species in the study area and surrounds that would have a long-term negative effect on the wetland system.

In order to prevent the spread of these species and to control them efficiently, it is important that a certified/licensed Pest Control Officer (PCO) is appointed to control the alien invasive plants. Where possible smaller trees, weeds and seedlings should be mechanically removed. Large trees must be cut, and a cut-stump treatment affected. Most herbicides have some toxicity to animals and water organisms. It is therefore important that the herbicides used have as little effect as possible on water organisms and have a short residual effect. The PCO will ensure that correct application is administered to have as little effect on the environment as possible. Weekly reports on the progress as well as herbicides used must be submitted to the Environmental Control Officer (ECO).

Erosion, surface runoff & stormwater

Urban development is characterised by large areas of sealed surfaces such as roads, houses, parking areas, etc. As a result, infiltration is considerably reduced with an increase in surface run-off that is normally channelled toward water courses directly or via storm water pipes that discharge the water into a watercourse. This run-off normally contains pollutants that can negatively affect the ecosystem functioning of the watercourse. Construction activities associated with urban development can also lead to massive, short/medium-term erosion unless adequate measures are implemented to control surface run-off.

Description & mitigation

The proposed development area is mostly flat and levelled with slight indentations due to the previous infilling. The infilling caused the area to slope from the wetland edge away from the wetland towards the northern part of the study site. It is thus unlikely that large erosion problems could be caused during construction. Care must however be taken that construction activities does not result in soil being deposited into the wetland and associated buffer zone since that would result in long-term damage to the wetland. Clearing activities and earth scraping should preferably be restricted to the dry season to prevent erosion It is recommended that sandbags are placed along the fenced-off wetland buffer zone to prevent unnecessary erosion from reaching the wetland and buffer zone. No stockpiling of soil must be done close to the buffer zone.

A stormwater management plan must be developed and approved for the proposed development by the relevant authorities before construction commences. This plan must make provision for trapping pollutants before the water is released into the wetland and also make provision that the force of the water is broken before releasing it into the system. In addition the water should be released at various points so as to prevent large-scale erosion.

Waste pollution

Domestic and industrial waste could severely influence the functioning, water flow and biodiversity of the wetland system.

Description & mitigation

All current waste must be removed from the edge and buffer zone area around the wetland. All waste generated by the construction activities must be removed and disposed of at a licenced waste disposal facility. No temporary waste storage areas may be closer than 30m from the egde of the buffer zone of the wetland. No rubbish pits should be allowed to be dug as well as no burning of waste. A fenced area must be erected where waste can be stored temporarily or for sorting before being disposed of.

A permanent area where waste would be temporarily stored and sorted before being disposed of to a licenced disposal site must be approved and included in the proposed development plan. This area must be at least 30m away from the wetland buffer and developed such that no waste can reach the wetland in any way whatsoever.

In many areas raw sewage is released directly into different watercourses. This is normally a result of bad maintenance and planning before development took place. Raw sewage causes permanent damage to especially a wetland such as this and will destroy the habitat of insects and aquatic organisms. The current planning makes provision for the sewage to be disposed of in an existing main sewer line and it will be outside of the wetland and the buffer zone. A monitoring programme must be developed during and after construction whereby the sewage system is monitored on a daily basis to detect any leakage and to implement the repair of the system within 6 hours after being detected. Contingency plans must also be developed to prevent the sewage from spilling into the wetland.

13 CONCLUSION & RECOMMENDATIONS

Wetlands are important and ecologically sensitive ecosystems that are protected by law. They are continually under threat from development and agriculture and should therefore be protected as far as realistically possible. Not only do they store and channel water, but they provide a variety of ecosystem services that support terrestrial and water ecosystems. Traditionally wetlands were regarded as cheap land that could easily be developed. Many previous and current developments have not incorporated proper environmental management plans resulting in the release of various pollutants into these systems. As a result, a large number of watercourses in the province are polluted and degraded especially the river systems.

The wetland on the property has been variously affected due to anthropogenic influences as described in this report. The area surrounding the wetland is transformed and comprises weeds and alien invasive species mostly. The permanently wet section of the wetland is the only part of the wetland system that has remained relatively natural although sections are degraded. The wetland receives a large amount of its water from three stormwater channels that have been artificially dug. The water is received from the residential developments along the northern boundary of the study area.

Due to the infilling the natural topography of the area has been altered permanently. The edge of the wetland is therefore higher than the surrounding terrestrial vegetation area meaning that no surface water flows towards the wetland, but rather into the artificial stormwater channels from where they reach the wetland.

GDARD requires a buffer zone of 30m around wetlands. The end-use objective for a buffer zone is the protection of a core area. Pressey (1997) states that one of the biological benefits of buffer zones is that it enlarges the natural habitat and ecosystem services of a natural area. Barborak (2014) states that it "does not work to legislate a simple boundary (such as 2 km around the exterior of a PA) and also just calling an area a

buffer without any efforts to control land use and development, or restore degraded ecosystems". The negative effect of a degraded ecosystem on a natural area could be equally devastating than development in that system. Garrat (2006) also argues that "a variable buffer zone model offers an effective means of co-managing the relationship between urban and natural areas". Based on the transformed condition of the buffer zone (comprising infilling, rubble, litter and pioneer weedy and alien invasive species) the 15m buffer zone as determined from the Buffer Tool (DEFF) is recommended on condition that the 15m area is rehabilitated and planted with indigenous species occurring around wetland (see recommendations in this report). It is thought that a rehabilitated 15m buffer zone is more realistic, and it would greatly enhance the total wetland ecosystem and its functioning. A 30m buffer zone would serve no purpose since it would not be feasible to rehabilitate such a large area and topographically it would not serve a function in protecting the wetland system as explained earlier in the report.

Based on the results of the wetland delineation of this study, the current proposed development plan will have to be adjusted to incorporate the 15m buffer zone and wetland. Other aspects that are recommended are:

- The services report should address stormwater attenuation through artificial wetlands and swales.
- A landscaping plan should be developed to indicate plant species and wetland management.
- A risk matrix report should be drawn up for the application of the Water use licence.

14 REFERENCES

Assessment Index in River Eco Classification: Manual for Eco Status Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry report. WRC Report No., DWAF, Pretoria, South Africa.

Barborak J.R. 2014. https://www.researchgate.net/post/Do_the_realities_of_buffer_zones_of_Protected Areas_live_up_to_the_theory_that_lead_to_their_implementation

Buffer Zone Guidelines for Rivers, Wetlands and Estuaries Part 1: Technical Manual. 2017. Douglas Macfarlane, Ian Bredin. Report to the Water Research Commission. WRC Report No. TT 715-1-17.

Collins, N.B., 2005. Wetlands: The basics, and some more. Free State Department of Tourism.

Department of Water Affairs and Forestry, 2005. A practical field procedure for identification and delineation of wetland and riparian areas. DWS, Pretoria.

Environmental and Economic Affairs. ISBN: 0-86886-708-X.

Garratt IML. 2006. The assessment of variable buffer zones to manage rocky ridges in Johannesburg, Gauteng. MSc Dissertation, North West University.

Kleynhans, C. J., Mackenzie, J. & Louw, M.D., 2007. Module F: Riparian Vegetation Response

Land Type Survey Staff. 1972-2006. *Land Types of South Africa: Digital map (1:250 000 scale) and soil inventory databases*. ARC-Institute for Soil, Climate and Water, Pretoria.

Marnewecke, G. & Kotze, D., 1999. Appendix W6: Guidelines for delineating the boundaries of a wetland and the zones within a wetland in terms of the South African Water Act. Version 1.0. Department of Water Affairs and Forestry, Pretoria, South Africa.

McVicar *et al*. 1977. Soil Classification: A Binomial System for South Africa. Department of Agriculture.

Mucina, L. & Rutherford, M. C. (Eds) 2006. The vegetation of South Africa, Lesotho and Swaziland.

National Water Act, Act 36 of 1998.

Ollis D, Snaddon K, Job N, Mbona N. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. SANBI Biodiversity Series 22.

Pressy, R.L. 1997. Protected areas: Where should they be and why should they be there? (In Spellerberg, I.F., ed. Conservation Biology, England, Longman Publishers. p. 171-185)

Strelitzia 19. South African National Biodiversity Institute, Pretoria.

15 ANNEXURES

15.1 SOIL OBSERVATIONS

15.2 PHOTOS AT OBSERVATIONS

15.3 PHOTOS

15.4 DESCRIBING AND CLASSIFYING COMMON TYPES OF WETLANDS

The wetland typing system proposed above (Table 1) identifies seven basic wetland types across South Africa, with true rivers being a separate (eighth) category characteristic of confined valley floors. Thus, in valley bottom positions of the landscape we could expect to find:

- Rivers;
- Lakes;
- Unchannelled Valley Bottoms;
- Channelled Valley Bottoms; and
- Meandering Floodplain systems

Seepage wetlands could be expected to be found in slope positions of the landscape, and depressional pans (sometimes surrounded by seepage wetlands) might be found in crest positions of the landscape. The characteristics of the seven basic wetland types (and contrasted to rivers) are described below.

15.4.1 RIVERS

Linear fluvial, eroded landforms which carry channelized flow on a permanent, seasonal or ephemeral/episodic basis. The river channel flows within a confined valley (gorge) or within an incised macro-channel. The “river” includes both the active channel (the portion which carries the water) as well as the riparian zone.

15.4.2 MEANDERING FLOODPLAINS

Linear fluvial, net depositional valley bottom surfaces which have a meandering channel which develop upstream of a local (e.g. resistant dyke) base level, or close to the mouth of the river (upstream of the ultimate base level, the sea). The meandering channel flows within an unconfined depositional valley, and ox-bows or cut-off meanders - evidence of meandering – are usually visible at the 1:10 000 scale (i.e. observable from 1:10 000 orthomaps).

The floodplain surface usually slopes away from the channel margins due to preferential sediment deposition along the channel edges and areas closest to the channel. This can result in the formation of backwater swamps at the edges of the floodplain margins.

15.4.3 CHANNELLED VALLEY BOTTOMS

Linear fluvial, net depositional valley bottom surfaces which have a straight channel with flow on a permanent or seasonal basis. Episodic flow is thought to be unlikely in this wetland setting. The straight channel tends to flow parallel with the direction of the valley (i.e. there is no meandering), and no ox-bows or cut-off meanders are present in these wetland systems. The valley floor is, however, a depositional environment such that the channel flows through deposited sediment. These systems tend to be found in the upper catchment areas.

15.4.4 UNCHANNELED VALLEY BOTTOMS

Linear fluvial, net depositional valley bottom surfaces which do not have a channel. The valley floor is a depositional environment composed of fluvial or colluvial deposited sediment. These systems tend to be found in the upper catchment areas, or at tributary junctions where the sediment from the tributary smothers the main drainage line.

15.4.5 LAKES

These are depressions in the valley bottoms which may be temporarily, seasonally or permanently inundated. Unlike pans, they are not deflationary erosional features, but instead they have, or would have had, an outlet at the downstream end of the valley (a low point); which has been variously blocked or otherwise restricted by dune deposits; terminal moraines (e.g. Lake District; U.K.), landslides or other depositional features across the valley bottom. Their shape is therefore determined by the surrounding slopes/higher ground (in contrast to the deflation processes creating the typical circular or oval depressional pan shapes).

15.4.6 SEEPAGE WETLANDS

Seepage wetlands are the most common type of wetland (in number), but probably also the most overlooked. These wetlands can be located on the mid- and footslopes of hillsides; either as isolated systems or connected to downslope valley bottom wetlands. They may also occur fringing depressional pans. Seepages occur where springs are decanting into the soil profile near the surface, causing hydric conditions to develop; or where throughflow in the soil profile is forced close to the surface due to impervious layers (such as plinthite layers; or where large outcrops of impervious rock force subsurface water to the surface).

15.4.7 DEPRESSIONAL PANS

Small (deflationary) depressions which are circular or oval in shape; usually found on the crest positions in the landscape. The topographic catchment area can usually be well- defined (i.e. a small catchment area following the surrounding watershed). Although often apparently endorheic (inward draining), many pans are “leaky” in the sense that they are hydrologically connected to adjacent valley bottoms through subsurface diffuse flow paths.

15.4.8 FLATS

In areas with weakly developed drainage patterns and flat topography, rainfall may not drain off the landscape very quickly, if at all, due to the low relief. In such areas (commonly characterized by aeolian deposits or recent sea floor exposures) the wet season water table may rise close to, or above, the soil surface, creating extensive areas of shallow inundation or saturated soils. In these circumstances the seasonal or permanently high groundwater table creates the conditions for wetland formation.

15.5 CRITERIA FOR THE IDENTIFICATION OF WETLANDS (DWAF)

The main indicators are:

1) Terrain – Valley bottom and seep on slopes
2) Soil form indicator –
3) Soil wetness indicator
    a. Hue 2.5YR
        i. >5 value and <2 chroma, or
        ii. >6 value and <4 chroma
    b. Hue 10YR
        i. 4 value and <2 chroma, or
        ii. 5 value and <3 chroma, or
        iii. 6 value and <4 chroma
    c. Hue 7.5YR
        i. 5 value and <2 chroma, or
        ii. >6 value and <4 chroma
    d. Hue 5YR
        i. 5 value and <2 chroma, or
        ii. >6 value and <4 chroma
    e. Hue 5Y
        i. >5 value and <2 chroma, or
4) Vegetation indicator – Will contain hydrophyte plants

There are three wetland vegetation indicators, each associated with specific soil properties.

Permanently waterlogged conditions are grey coloured or organic soils.

- Valley bottom terrain morphology;
- Champagne, Katspruit, Willowbrook and Rensburg soil form – all forms have gleyed subsoil;
- Wetness - prominent grey matrix, few to no high chromas within 500 mm.
- Vegetation
    - Large proportion of hydrophytes
    - Emergent plans: reeds, sedges, etc.;
    - Floating or submerged aquatic plants.

Seasonally waterlogged soils have a grey matrix with many mottles.

They usually occur just outside the area of normal base flow and are saturated for a significant portion of the rainy season.

- Valley bottom terrain morphology;

- Kroonstad, Longlands, Wasbank, Lamotte, Escourt, Klapmuts, Vilafontes, Kinkelbos, Cartref, Fernwood, Westleigh, Dresden, Avalon, Glencoe, Pinedene, Bainsvlei, Bloemdal, Witfontein, Sepane, Tukulu, Montagu.
- Wetness
  - Grey matrix (>10%)
  - Many high chroma mottles
- Vegetation
  - Hydrophilic sedges that are restricted to wetland areas

Temporary waterlogged soils are normally grey-brown on colour with few mottles.

- Valley bottom terrain morphology;
- Inhoek, Tstitsikamma, Houwhoek, Molopo, Kimberley, Jonkersberg, Groenkop, Etosha, Addo, Brandvlei, Glenrosa or Dundee.
- Wetness
  - Minimal grey matrix (>10%)
  - Few high chroma mottles
- Vegetation
  - Predominantly grasses which occur on non-wetland areas and hydrotropic species.
  - Predominantly woody species which occur on non-wetland areas and hydrotropic species.

Outside this zone is the adjacent terrestrial area that is not classified as wetlands.

15.6 INDICATOR PLANTS WHERE WETLANDS MAY OCCUR

Gramineae (Grasses)

1) *Imperata cylindrical* Temporary wetness
2) *Setaria sphacelata* Temporary and seasonal
3) *Pennisetum thunbergii* Temporary and seasonal
4) *Hemarthria altissima* Temporary and seasonal
5) Paspalum urvillei Temporary
6) Paspalum dilatatum Temporary
7) *Paspalum distichum* Seasonal and permanent
8) *Andropogon appendicularis* Temporary and seasonal
9) *Ischaemum fasciculatum* Seasonal and permanent
10) *Arundinella nepalensis* Temporary and seasonal
11) *Andorpogon eucomis* Temporary and seasonal
12) *Festuca caprina* Temporary and seasonal
13) *Aristida junciformis* Temporary and seasonal
14) *Eragrostis plana* Temporary
15) *Eragrostis planiculmis* Temporary and seasonal
16) *Phragmites australis* Permanent
17) *Leersia hexandra* Temporary and seasonal

18) *Miscanthus capensis* Temporary and seasonal

19) *Miscanthus junceus* Temporary and seasonal

Cyperaceae (Sedges)

1) *Cyperus sexangularis* Temporary and seasonal
2) *Cyperus latifolius* Seasonal and permanent
3) *Cyperus fastigiatus*
4) *Cyperus marginatus*
5) *Fuirena pubescence*
6) *Kyllinga erecta*
7) *Scleria welwitschii*
8) *Eleocharis dregeana*
9) *Eleocharis limosa*
10) *Schoenoplectus brachycerus*
11) *Schoenoplectus corymbosus*

Juncaceae (Rushes)

1) *Typhaceae* (Bullrushes) Permanent
2) *Typha capensis*

Potamogetonaceae (Pondweeds)

1) *Potamogeton thunbergii* Permanent

Asphodelaceae (Red-hot pokers)

1) *Kniphofia* species
2) *Kniphofia linearfolia*

Amaryllidaceae (Vlei lilies) Wetland and non-wetland

1) *Crinum* species
2) *Crinum macowanii*

Polygonaceae (Knotweeds) Permanent and or seasonal

1) *Persicaria attenuata*

Additional species form other families

1) Xyris capensis
2) *Satyrium hallackii*
3) *Ranunculus multifidus*
4) *Sium repandum*
5) *Gunnera repandum*
6) *Mentha aquatica*

APPENDIX H: EMPR

ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

In terms of
Regulation 22 (b) of Government Notice No. R385 in terms of Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998), July 2006 as amended 2008 and the Environmental Impact Assessment Regulations 2014 (as amended)

APPLICATION FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED SHOPPING CENTRE DEVELOPMENT ON A PORTION OF ERF 440 AND A PORTION OF ERF 488, BRENTWOOD EXTENSION 1 WITHIN THE CITY OF EKURHULENI

Prepared on behalf of:

The Environmental Authorisation Holder: SUMMIT PROPERTY COMPANY (Pty) Ltd

For review and approval by:

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NATIONAL ENVIRONMENTAL MANAGEMENT ACT

An EMPr must comply with Section 24N of NEMA and the Environmental Impact Assessment Regulations 2014 (GN 982 Appendix 4) which requires that it must include the following:

REQUIREMENTS	REPORT SECTION
a) details of- (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Annexure
b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section B2
c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Annexure
d) a description of the impact management [objectives] outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including- (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	Section B
e) a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	Section B
f) a description of proposed impact management actions, identifying the manner in which the impact management [objectives and] outcomes contemplated in paragraph (d) [and (e)] will be achieved, and must, where applicable, include actions to – (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Section B
g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 2,3 & 4 and 9
h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f)	Section 3 & 4 and B
i) an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 6, 7 and 8
j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Secton 4 and B
k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 4
l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 4 and B

m) an environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section A and B
n) any specific information that may be required by the competent authority.	N/A
1. Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A

ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

PART A: BACKGROUND AND CONTEXT

1. INTRODUCTION

Delron Consulting, independent Environmental Assessment Practitioners (EAP) have been appointed by the applicant, **SUMMIT PROPERTY COMPANY (Pty) Ltd**, to ensure compliance with the regulations contained in the National Environmental Management Act, 1998 (NEMA, Act no. 107 of 1998) and Environmental Impact Assessment Regulations, 2014 (as amended) for:

The Proposed Shopping Centre Development on A Portion of Erf 440 and A Portion of Erf 488, Brentwood Extension 1 within the City of Ekurhuleni.

This EMPr (to be amended to include the conditions of the Environmental Authorisation (EA) when issued) is binding on the applicant. This EMPr is submitted as per the requirements of a Basic Assessment in terms of NEMA. The monitoring of compliance of the EMPr is mandatory in terms of the Construction Phase and a completion audit at the end of the Construction Phase will be a requirement of the EA.

This EMPr must be included in the tender documents of all prospective contractors and must also be included in the final contract awarded. The EMPr must be regarded as binding on all contractors, sub-contractors, agents, consultants and construction staff on the property.

The full and approved EMPr will be made available to all contractors working on the project. Certain fundamental aspects are, therefore, of importance:

- The holder of the authorisation is responsible for ensuring compliance with the conditions contained in the Environmental Authorisation. This includes any person acting on the holder's, including but not limited to, an agent, sub-contractor, employee, consultant or person rendering a service to the holder of the authorisation.
- It is the responsibility of the applicant / holder / owner to ensure that his/her main contractor and any sub-contractors are made aware of the environmental requirements for working on the estate.
- The contractor(s) will be required to make good any damage caused through their actions or the actions of their sub-contractors (in addition to any penalties for non-compliance issued).

Please note that this EMPr is a dynamic document, which could change as the need arises.

1.1 Need

The National Environmental Management Act 107 of 1998 (NEMA) requires that an environmental management programme (EMPr) be submitted where an environmental impact assessment must be utilised as the basis for a decision on an application for environmental authorisation.

1.2 Purpose and Objectives

The EMPr contains a general environmental controls section which describes environmental requirements relevant to all projects. The EMPr also contains a project specific section which describes mitigation measures and environmental control requirements specific to the particular project. These requirements will be based on the findings from the BA/EIA and any conditions attached to Environmental Authorisation (EA).

The project specific section of the EMPr identifies where project specific information from the EIA or BA will need to be included in to the EMPr. This includes:

- Environmental sensitivity mapping including "No Go" areas.
- Final project footprint.
- Project information including landowner details and specific access requirements.

The overall objectives of the EMPr are to realise the following:

- Ensure that impact avoidance and mitigation measures associated with project construction are identified and that practical recommendations are provided to implement and monitor these actions.
- Ensure environmental protection.

2. EMPR STRUCTURE

Part A of the document provides background context to the EMPr. Included in this section are:

- General national level legal requirements for a typical project;
- The description of the roles and responsibilities of key persons involved in the construction stage of a project and associated responsibilities in the context of the EMPr;

Part B details environmental controls. Section 1 of Part B describes general environmental controls to be implemented for construction activities relevant to the project. Controls in this section reflect minimum and general requirements for managing and mitigating impacts for specific construction related activities.

Section 2 of Part B describes project specific environmental control requirements. These controls are based on findings of the BA/EIA and are in addition to the general controls described in Section 1. Part C (Appendices) of the document contains specifications for carrying out certain environmental controls described in Part B Section. The contractor shall also include all approved method statements in Part C of the document.

3. ROLES AND RESPONSIBILITY

The effective implementation of the EMPr is dependent on established and clear roles, responsibilities and reporting lines within an institutional framework. This section of the EMPr identifies the various environmental roles and reporting lines and defines responsibilities for each role within the institutional framework. This institutional structure will be maintained throughout the construction phase until such time as the final construction phase Environmental Audit Report has been prepared and accepted.

The Environmental Responsibilities and Reporting Structure are represented in Table 1 below:

Function	Role and Responsibilities
Environmental Assessment Practitioner (EAP)	**Responsibility** • The EAP is to be appointed by the Developer. The responsibility of the EAP is to supplement the pre-approved EMPr requirements with project specific information and requirements from the authorised Basic Assessment or Environmental Impact Assessment Report. • Details of the EAP appointed by the developer including the Curriculum Vitae of the EAP shall be included in the EMPr.
Developer's Project	**Role**

Function	Role and Responsibilities
Manager (DPM)	The holder of the EA to which this EMPr relates holds legal responsibility for compliance with this EMPr and any other arrangements must be entered into between such holder and such other party. The Developer's Project Manager will have overall responsibility for the management of the project and the implementation of the EMPr. **Responsibilities** • Be fully conversant with the conditions of the EA; • Ensure that all stipulations within the EMPr are communicated and adhered to by the Developer and its Contractor(s); • Monitor the implementation of the EMPr throughout the project by means of site inspections and meetings. Overall management of the project and EMPr implementation; • Ensure that periodic environmental performance audits are undertaken on the project implementation; and • Ensure all permits, authorisations and licences are obtained, monitored and adhered to.
Environmental Control Officer (ECO)	**Role** The ECO should be employed by the developer for the duration of the project. The ECO should have appropriate training and experience in the implementation of environmental management specifications. The primary role of the Environmental Control Officer is to act as an independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct periodic site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise. The ECO is also required to conduct compliance audits, verifying the monitoring reports submitted by the cEO. The ECO provides feedback to the Developer Site Supervisor and Project Manager regarding all environmental matters. The Contractor and cEO are answerable to the Environmental Control Officer for non-compliance with the Performance Specifications as set out in the environmental authorisation and EMP. The Environmental Control Officer provides feedback to the Developer Site Supervisor and Project Manager, who in turn reports back to the Implementing Agent and I&AP's, as required. Issues of non-compliance raised by the ECO must be taken up by the Project Manager, and resolved with the Contractor as per the conditions of his contract. Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation, not allowed for in the Performance Specification) must be endorsed by the Project Manager. The ECO must also, as specified by the Environmental Authorisation, report to the Government authorizing department as and when required. **Responsibilities** The responsibilities of the ECO will include the following: • Be aware of the findings and conclusions of the Environmental Impact Assessment and

Function	Role and Responsibilities
	Water Use Licensing process (where applicable) and the conditions stated within the environmental licenses; • Be familiar with the recommendations and mitigation measures of this EMPr; • Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them; • Undertake regular and comprehensive site inspections / audits of the construction site according to the EMPr and applicable licenses in order to monitor compliance with the EMPr; • Educate the construction team about the management measures contained in the EMPr and environmental licenses; • Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective; • Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements; • In consultation with the Developer Site Supervisor order the removal of person(s) and/or equipment which are in contravention of the specifications of the EMPr and/or environmental licenses; • Liaison between the Developer Project Manager, Contractors, authorities and other lead stakeholders on all environmental concerns; • Issuing of site instructions to the Contractor for corrective actions required; • Compile a regular environmental audit report highlighting any non-compliance issues as well as satisfactory or exceptional compliance with the EMPr; • Validating the regular site inspection reports, which are to be prepared by the contractor Environmental Officer (cEO); • Checking the cEO's record of environmental incidents (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken; • Checking the cEO's public complaints register in which all complaints are recorded, as well as action taken; • Assisting in the resolution of conflicts; In case of non-compliances, the ECO must first communicate this to the Senior Site Supervisor, who has the power to ensure this matter is addressed. Should no action or insufficient action be taken, the ECO may report this matter to the authorities as non-compliance; • Maintenance, update and review of the EMPr; • Communication of all modifications to the EMPr to the relevant stakeholders. Further note, the ECO function is not limited to the construction phase alone, but is also an active role during the operational and later phases of the project.
Contractor (C)	**Role** The Contractor appoints the cEO and has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract are in line with the EMPr and that Method Statements are implemented as described. **Responsibilities** • Implementation and compliance with recommendations and conditions of the EA and EMPr, including providing the Contractor's Environmental Protection Policy and the

Function	Role and Responsibilities
	specific Method Statements for the project; • Appoints dedicated and qualified contractor Environmental Officer (cEO) to work with the ECO; and • Ensure all site staff are trained and kept updated in terms of the EA, EMPr and other legal requirements.
contractor Environmental Officer (cEO)	**Role and Qualifications** Each Contractor affected by the EMPr should appoint a contractor Environmental Officer, who is responsible for the on-site implementation of the EMPr (or relevant sections of the EMPr). The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the Environmental Control Officer and the public. The cEO ensures that all Sub-contractors working under the Contractor abide by the requirements of the EMPr. The Contractor is answerable to the Project Manager for all environmental issues associated with the project. Contractor performance will, amongst others, be assessed on health, safety and environmental management criteria. Their primary role is to coordinate the environmental management activities of the Contractor on site. **Responsibilities** • Be on site throughout the duration of the project and be dedicated to the project; • Ensure all their staff are aware of the environmental requirements, conditions and constraints with respect to all of their activities on site; • Implementing the environmental conditions, guidelines and requirements as stipulated within the EA, EMPr and Method Statements; • Attend the Environmental Site Meeting; • Undertaking corrective actions where non-compliances are registered within the stipulated timeframes; • Report back formally on the completion of corrective actions; • Environmental monitoring as required by applicable legislation; • Assist the ECO in maintaining all the site documentation; • Prepare the site inspection reports and corrective action reports for submission to the ECO; • Assist the ECO with the preparing of the monthly report; and • Where more than one Contractor is undertaking work on site, each company appointed as a Contractor will appoint a cEO representing that company.

4. ENVIRONMENTAL DOCUMENTATION REPORTING AND COMPLIANCE

To ensure accountable and demonstrated implementation of the EMPr, a number of reporting systems, documentation controls and compliance mechanisms shall be in place for all projects as a minimum requirement. This section of the report details each of these and how they shall be used throughout the project EMPr.

4.1 Document Control/Filing System

The approved filing system shall be established at the outset of the construction phase and shall be maintained throughout the lifespan of the project. At a minimum, all documentation detailed below will be stored in the EMPr file. A hardcopy of all documentation shall be filed, while an electronic copy may be kept where relevant. The filing system must be updated and relevant documents added as required. The EMPr file must be made available at all times on request by the Competent Authority (in terms of NEMA) or other relevant authorities. The EMPr file will form part of any Environmental Audits undertaken.

4.2 Documentation To Be Available

At the outset of the project the following documents shall be placed in the filing system and be accessible at all times:

- Full copy of the signed Environmental Authorisation from the Competent Authority in terms of NEMA granting approval for the activity;
- Records of acknowledgement and acceptance of the EMPr from the Competent Authority in terms of NEMA;
- Complete copy of the EMPr;
- All signed copies of the Contractor's Environmental Agreement;
- All the Contractor's Method Statements;
- Completed Monthly Environmental Checklists;
- Minutes and attendance register of Environmental Site meetings;
- An up-to-date Environmental Incident Log;
- A copy of all non-compliances issued;
- A copy of all corrective actions signed off. The corrective actions must be filed in such a way that a clear reference is made to the non-compliance record.

4.3 Monthly Environmental Checklists

The ECOs are required to complete a Monthly Environmental Checklist which meets the requirements of the EMPr. The checklists will form the basis for the Monthly Environmental Reports. Copies of all competed checklists will be attached as Annexures to the Final Environmental Audit Report.

At a minimum the Monthly checklist / report is to cover the following:

- Deviations and non-compliances with the checklists;
- Non-compliances issued;
- Completed and reported corrective actions;
- General environmental findings and actions.

4.4 Required Method Statements

A Method Statement is a written submission by the contractor to the Developer's Project Manager, Developer's Site Supervisor or ECO in response to the EMPr, setting out the plant, materials, labour and method the contractor proposes using to carry out an activity. The Method Statement will be done in such detail that the ECOs are enabled to assess whether the contractor's proposal is in accordance with the EMPr.

The Method Statement shall cover applicable details with regard to:

- construction procedures;
- materials and equipment to be used;
- getting the equipment to and from site;

- how the equipment/ material will be moved while on site;
- how and where material will be stored;
- the containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- timing and location of activities;
- compliance/ non-compliance with the EMPr; and
- any other information deemed necessary by the ECOs.

Unless indicated otherwise by the Project Manager, the Contractor shall provide the following Method Statements to the Project Manager no less than 14 days prior to the programmed Commencement Date of the subject Works or activity:

- Site establishment – Camps, Lay-down or storage areas, satellite camps, infrastructure;
- Batch plants;
- Workshop or plant servicing;
- Handling, transport and storage of Hazardous Chemical Substance's;
- Vegetation management – Protected, clearing, aliens, felling;
- Access management – Roads, gates, crossings etc.;
- Fire plan;
- Waste management – transport, storage, segregation, classification, disposal (all waste streams);
- Social interaction – complaints management, compensation claims, access to properties etc.;
- Water – use (source, abstraction and disposal), access and all related information, crossings and mitigation;
- Emergency preparedness – Spills, training, other environmental emergencies;
- Dust and noise;
- Fauna interaction and risk management – only if the risk was identified – wildlife interaction especially on game farms; and
- Heritage and palaeontology management.

The ECOs shall ensure that the contractors perform in accordance with these Method Statements. Completed and authorised Method Statements shall be captured in Appendix A.

4.5 Environmental Incident Log (Diary)

The ECOs are required to maintain an up-to-date and current Environmental Incident Log (environmental diary).

The Environmental Incident Log is a means to record all environmental incidents for which a non-compliance notice would not be issued. An environmental incident is defined as:

- Any deviation from the listed environmental mitigation measures (listed in this EMPr) that may be addressed immediately by the ECOs. (For example a contractor's staff member littering or a drip tray that has not been emptied);
- any environmental impact resulting from an action or activity by a contractor in contravention of the environmental stipulations and guidelines listed in the EMPr which as a single event would have a minor impact but which if cumulative and continuous would have a significant effect (for example no toilet paper available in the ablutions for an afternoon); and
- General environmental information such as road kills or injured wildlife.

The ECOs are to record all environmental incidents in the Environmental Incident Log. All incidents regardless of severity must be reported to the Developer. The Log is to be kept in the EMPr file and at a minimum the following will be recorded for each environmental incident:

- The date and time of the incident;
- Description of the incident;
- The name of the Contractor responsible;
- The incident must be listed as significant or minor;
- If the incident is listed as significant, a non-compliance notice must be issued, and recorded in the log;
- Remedial or corrective action taken to mitigate the incident; and
- Record of repeat minor offences by the same contractor or staff member.

The Environmental Incident Log will be captured in the Environmental Audit Report.

4.6 Non-Compliance

A non-compliance notice will be issued to the responsible contractor by the ECOs via the Developer's Site Supervisor or Project Manager. The non-compliance notice will be issued in writing; a copy filed in the EMPr file and will at a minimum include the following:

- Time and date of the non-compliance;
- Name of the contractor responsible;
- Nature and description of the non-compliance;
- Recommended / required corrective action; and
- Date by which the corrective action to be completed.

The Contractors shall act immediately when a notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant authority (DAFF, DEA, DWS) for them to deal with the transgression, as it deems fit. The Contractor is deemed not to have complied with the EMPr if, inter alia:

- Deviates from the environmental conditions and requirements as set out in the EMPr that has, or may cause, an environmental impact; OR
- Contravenes environmental legislation; OR
- Results in an unforeseen environmental impact. This may be caused by direct or indirect actions or activities on site. Significance will be determined by the ECOs, but will be informed by geographic extent, duration, lasting effects of the impact and extent of remediation to rectify the impact.

4.7 Corrective Action Records

For each non-compliance notice issued, a documented corrective action must be recorded. On receiving a non-compliance notice from the Developer's Site Supervisor, the contractor's cEO will ensure that the corrective actions required take place within the stipulated timeframe. On completion of the corrective action the cEO is to issue a Corrective Action Report in writing to the ECOs. If satisfied that the corrective action has been completed, the ECOs are to sign-off on the Corrective Action Report, and attach the report to the non-compliance notice in the EMPr file. A corrective action is considered complete once the report signed off by the ECOs.

4.8 Fines and Penalties

Spot fines up to a maximum value of R10 000 per offence can be instituted at the discretion of the ECO for any breach or non-compliance in terms of the EMPr and EA (FINES ISSUED WILL INCREASE EXPONENTIALLY FOR REPEAT OFFENCES).

A trust fund is to be established for the collection of fines and the spending of this fund is to be at the discretion of the ECO for environmental rehabilitation of the area and must be documented.

4.9 Contractor Environmental Agreements

Each contractor working on site is required to sign the Contractor Environmental Agreement. This agreement provides for:

- Signed acknowledgement by the Contractor of the EMPr and the environmental controls and stipulations therein;

The signed copies of the Contractor Environmental Agreements are to be filed in the EMPr file. No contractor will be allowed to start work without having signed the Contractor Environmental Agreement.

4.10 Photographic Record

A digital photographic record will be kept. The photographic record will be used to show before, during and post rehabilitation evidence of the project as well used in cases of damages claims if they arise. Each image must be dated and a brief description note attached.

The Contractor shall:

1. Allow the ECOs access to take photographs of all areas, activities and actions.

The ECOs shall keep an electronic database of photographic records which will include:

(i) Pictures of all areas designated as work areas, camp areas, construction sites and storage areas taken before these areas are set up;
(ii) All bunding and fencing;
(iii) Road conditions and road verges;
(iv) Condition of all farm fences;
(v) Topsoil storage areas;
(vi) Waste management sites;
(vii) Ablution facilities (inside and out);
(viii) Any non-conformances deemed to be “significant”;
(ix) All completed corrective actions for non-compliances;
(x) All required signage; and
(xi) All areas before, during and post rehabilitation.

Include relevant photographs in the Final Environmental Audit Report

4.11 Complaints Register

The ECOs shall keep a current and up-to-date complaints register. The complaints register is to be a record of all complaints received from communities, stakeholders and individuals. The Complaints Record shall:

(i) Record the name and contact details of the complainant;

(ii) Record the time and date of the complaint;
(iii) Contain a detailed description of the complaint;
(iv) Where relevant and appropriate, contain photographic evidence of the complaint or damage (ECOs to take relevant photographs); and
(v) Contain a copy of the ECOs written response to each complaint received and keep a record of any further correspondence with the complainant. The ECO's written response will include a description of any corrective action to be taken and must be signed by the Contractor, ECO and affected party. Where a damage claim is issued by the complainant, the ECOs shall respond as described in (9.13) below.

4.12 Environmental Audits

Environmental Audits of the construction phase and implementation of the EMPr will be undertaken by the ECO and are a legal requirement in terms of NEMA once an EA is issued and as long as the EMPr is valid. The findings and outcomes of these audits will be recorded in the EMPr file.

The environmental audits and associated reports must be conducted and submitted to the Competent Authority at intervals as indicated in the environmental authorisation.

4.13 Final Environmental Audit Report

On final completion of the Construction Phase, the ECOs are required to prepare a Final Environmental Audit Reports. The Report is to be submitted to the Competent Authority for acceptance and approval. The Environmental Report shall contain the following in accordance with Appendix 7 of National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental impact Assessment Regulations, 2014.

- Details of the independent person who prepared the report;
- Details of the expertise of independent person that compiled the report;
- A declaration that the independent auditor is independent in a form as may be specified by the Competent Authority;
- An indication of the scope of, and the purpose for which, the environmental audit report was prepared;
- A description of the methodology adopted in preparing the environmental audit report;
- An indication of the ability of the EMPr, and where applicable, the closure plan to-
    - Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis;
    - Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and
    - Ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;
- A description of any assumptions made, and any uncertainties or gaps in knowledge;
- A description of any consultation process that was undertaken during the course of carrying out the environmental audit report;
- A summary and copies of any comments that were received during any consultation process; and
- Any other information requested by the Competent Authority.

Acceptance and approval of the Final Environmental Audit Report by the Competent Authority will end the construction phase EMPr as successful and completed.

PART B: ENVIRONMENTAL CONTROLS

The Environmental Controls are described in two sections:

1. SECTION 1: GENERAL ENVIRONMENTAL CONTROLS

This section refers to construction related activities that are common to most projects. For each activity a set of prescribed environmental controls and associated management actions have been identified.

Contractors shall implement these controls for all projects as a minimum requirement for mitigating the impact of particular construction related activities.

2. SECTION 2: PROJECT SPECIFIC ENVIRONMENTAL CONTROLS

This section refers to project specific environmental controls. These are specific actions or mitigation measures related to the project itself and based on findings from the BA/EIA or conditions attached to the environmental authorisation. They are more specific than the environmental controls included in Section 1 and refer to sensitive features where additional or specific controls are needed to manage impacts. Controls in these sections shall be referenced spatially in the context of the final project footprint.

The EAP is therefore required to complete this section by producing an environmental sensitivity of the final project footprint and any site specific mitigation measures are required.

Additional project specific information included in this section shall include landowner contact information and any specific requirements regarding access to land.

SECTION 1: GENERAL ENVIRONMENTAL CONTROLS

B.1 Environmental Awareness Training

Management Objective: Environmental training of construction staff minimises the occurrence of environmental impact to the work area.					
Management Outcome: Environmental impact as a result of construction activities is minimised through the development of effective environmental awareness training material and execution of environmental awareness training all staff					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All staff to receive environmental awareness training; 2. All staff are aware of the conditions and controls linked to the Environmental Authorisation and within the EMPr; 3. All staff are made aware of their individual roles and responsibilities in achieving compliance with the environmental authorisation and EMP; 4. Environmental awareness training should include as a minimum the following: a) Description of significant environmental impacts, actual or potential, related to their work activities; b) Mitigation measures to be implemented when carrying out specific activities; c) Emergency preparedness and response procedures; d) Emergency procedures; e) Procedures to be followed when working near or within sensitive areas; f) Wastewater management procedures; g) Water usage and conservation; h) Solid waste management procedures; i) Sanitation procedures; j) Disease prevention; and k) Chance find procedure for archaeological/paleontological/historical sites unearthed during construction; 5. A record of all environmental awareness training courses undertaken as part of the EMPr must be available; 6. A staff attendance register of all staff to have received environmental awareness training must be available.	Contractor	Pre-construction	Conduct training for all construction personnel.	Monthly	ECO and Project Developer

B.2 Construction Site Establishment

Management Objective: Ensure that environmental issues are taken into consideration in the planning and construction of site establishment
Management Outcome: Impact to the environment during site establishment is minimised.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. A Method Statement shall be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form of a plan showing the location of key infrastructure and services (where applicable), including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management; 2. Location of construction camps must be carefully considered and approved by the ECOs to ensure that the site does not impact on sensitive areas identified in the EIA or site walk through; 3. Sites should be located where possible on previously disturbed areas; and 4. The construction camp shall be fenced.	Contractor	Pre-construction	Monitor compliance and record non-compliance and incidents.	Before construction	ECO and Project Developer

B.3 No-Go Areas

Management Objective: Construction related activity inside No-Go areas is prevented in an effort to avoid environmental impacts to such areas.					
Management Outcome: Impact to No-Go areas is avoided through the effective demarcation and management of these areas.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Identification of No-Go areas is to be informed by the BA/EIA and any additional areas identified during construction; 2. Erect, demarcate and maintain a temporary fence around the perimeter of any No-Go area; 3. Fencing of No-Go areas is to be undertaken in accordance with Section B5: Fencing and gate installation; and 4. Unauthorised access and construction related activity inside No-Go areas is prohibited.	Contractor ECO	Pre-construction	Sensitivity Plan	Before construction	ECO and Project Developer

B.4 Access Roads

Management Objective: Minimise impact to the environment through the planned and controlled movement of vehicles on site.		
Management Outcome: Vehicle movement to adhere to agreed access plan.		
Impact Management Actions	**Implementation**	**Monitoring**

	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Maximum use of existing roads shall be made; 2. In circumstances where private roads must be used, the condition of the said roads shall be recorded prior to use and the condition thereof agreed by the landowner, the Development Project Manager and the contractor; 3. All private roads used for access to the site shall be maintained and upon completion of the works, be left in at least the original condition. As far as possible, access roads shall follow the contours in hilly areas, as opposed to winding down steep slopes; 4. Access roads shall be constructed in accordance with design standards (SANS 1200).	Contractor	Pre-construction	Monitor compliance and record non-compliance and incidents.	Before construction & monthly	ECO and Project Developer

B.5 Fencing and Gate Installation

Management Objective: To minimise impact to the environment and ensure safe and controlled access to the site through the erection of fencing and gates where required					
Management Outcome: The erection of fencing and management of fencing is to be undertaken in accordance with the Fencing Act No 31 of 1963					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. The Fencing Act No 31 of 1963 shall be adhered to at all times with regards to the leaving open of gates and the dropping of fences for crossing, purposes, climbing and wilful damage or removal of gates; 2. Use existing gates provided to gain access to all parts of the defined Working Area, where possible; 3. All gates shall be fitted with locks and be kept locked at all times during the construction phase; 4. Where there is no suitable gate for access to the site, on the instruction of the Development Project Manager, a gate shall be installed; 5. Care shall be taken that the gates shall be so erected that there is a gap of no more than 100 mm between the bottom of the gate and the ground; 6. Original tension shall be maintained in the fence wires; 7. All gates installed in electrified fencing must be re-electrified; 8. All demarcation fencing and barriers shall be maintained in good working order for the duration of construction activities; 9. Fencing shall be erected around the construction camp, batching plants, hazardous storage areas, and all designated no-go areas, where applicable; 10. All fencing shall be constructed of high quality material bearing the SABS mark;	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

11. Fenced areas with gate access will remain locked after hours, during weekends and on holidays if staff are away from site. Site security will be required at all times; 12. On completion of the project all temporary fences are to be removed and where possible re-used by the contractor at new projects; 13. The contractor will ensure that all fence uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely.					

B.6 Water Supply Management

Management Objective: Undertake responsible water usage during construction					
Management Outcome: Water use during construction is compliant with the requirements of the National Water Act (No 36 of 1998)					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All abstraction points or bore holes must be registered with the DWS and suitable water meters installed to ensure that the abstracted volumes are measured on a daily basis; 2. Should water abstraction be required and the necessary authorisation from DWS and permission from the landowner has been received, the Contractor shall ensure the following: a) The vehicle abstracting water from a river does not enter or cross it and does not operate from within the river; b) No damage occurs to the river bed or banks and that the abstraction of water does not entail stream diversion activities; and c) All reasonable measures to limit pollution or sedimentation of the downstream watercourse are implemented. 3. Ensure water conservation is being practiced by: a) Minimising water use during cleaning of equipment; b) Undertaking regular audits of water systems; and c) Including a discussion on water usage and conservation during environmental awareness training.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.7 Waste Water Management

Management Objective: To avoid, manage and mitigate potential impacts to the environment caused by waste water discharge during construction.		
Management Outcome: Waste water management is undertaken in accordance with relevant national and provincial legislation and local by-laws.		
Impact Management Actions	**Implementation**	**Monitoring**

	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Appropriate pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into watercourses or water bodies shall be designed and implemented; 2. Runoff from the cement/ concrete batching areas shall be strictly controlled, and contaminated water shall be collected, stored and either treated or disposed of off-site, at a location approved by the Project Manager /ECO; 3. All spillage of oil onto concrete surfaces shall be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility; 4. Natural storm water runoff not contaminated by construction operations and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager's approval and support by the ECO; 5. Water that has been contaminated with suspended solids, such as soils and silt, may be released into watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment shall be subject to the Project Manager's approval and support by the ECO.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.8 Solid Waste Management

Management Objective: To avoid, manage and mitigate potential impacts to the environment caused by the incorrect storage, handling and disposal of general and hazardous solid waste.					
Management Outcome: Solid waste management is undertaken in accordance with relevant national and provincial legislation and local by-laws.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All measures regarding waste management shall be undertaken using an integrated waste management approach; 2. Sufficient, covered waste collection bins (scavenger and weatherproof) shall be provided; 3. A suitably positioned and clearly demarcated waste collection site shall be identified and provided; 4. The waste collection site shall be maintained in a clean and orderly fashion; 5. Waste shall be segregated into separate bins and clearly marked for each waste type; 6. Staff shall be trained in waste segregation; 7. Recycling of waste types shall be maximised; 8. Bins shall be emptied regularly; 9. General waste shall be disposed of at recognised and registered waste disposal sites/ recycling company; 10. Hazardous waste shall be disposed of at a registered waste disposal site;	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

11. Certificates of disposal for general, hazardous and recycled waste shall be maintained; 12. Under no circumstances shall any waste be disposed of, burned or buried on site.					

B.9 Protection of Watercourses and Water Bodies

Management Objective: Construction related activity is undertaken in a manner which prevents impacts to watercourses, water bodies and wetlands.					
Management Outcome: Impact to No-Go areas is avoided through the effective demarcation and management of these areas.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All watercourses and water bodies shall be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the Contractor's activities; 2. In the event of a spill, prompt action shall be taken to clear the polluted or affected areas; 3. Where possible, no construction equipment shall traverse any seasonal or permanent wetland; 4. No natural watercourse or water body shall be used for the purposes of swimming, personal washing and the washing of machinery or clothes; 5. Excavation or construction in a water course or wetland area shall be avoided unless exceptional circumstances require that excavation or construction cannot be avoided 6. Road construction shall be in accordance with SANS 1200; 7. No excavation or construction shall be permitted within the 1:100 year flood line or riparian zone (whichever is the greatest) of a watercourse or within 500 m from the boundary of a wetland area without prior approval from the Competent Authority (DWS or Catchment Management Agency) in the form of a water use authorisation; 8. When working in or near any watercourse or wetland, the following environmental controls and consideration shall be taken: a. River levels during the period of construction; b. Construction within flowing water is to be minimised. All diversions shall be in place, water diverted away from the Working Area and the area properly stabilised prior to excavations commencing; c. When working in flowing water, downstream sedimentation shall be controlled by installing and maintaining the necessary temporary sedimentation barriers, e.g. geotextile silt curtains or sedimentation weirs constructed out of suitably secured straw bales. Sedimentation barriers shall be a maximum of 25 m downstream of the construction activities;	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

d. During the execution of the Works, appropriate measures to prevent pollution and contamination of the riverine environment shall be implemented e.g. including ensuring that construction equipment is well maintained; e. Where earthwork is being undertaken in close proximity to any watercourse, slopes shall be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the channel; and f. Appropriate rehabilitation and re-vegetation measures for the river banks shall be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as construction allows.					

B.10 Vegetation Clearing

Management Objective: To ensure the safe mechanical and electrical construction and operation of the project without causing unnecessary environmental damage.					
Management Outcome: Vegetation clearance is minimised through adherence to EMPr vegetation clearance requirements.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Indigenous vegetation which does not interfere with the safe construction and operation of the project shall be left undisturbed; 2. Protected or endangered species may occur on or near the construction site. Special care should be taken not to damage such species; 3. Search, rescue and replanting of all protected and endangered species likely to be damaged during construction shall be identified by the Botanical Specialist and completed prior to any construction or clearing; 4. Permits for removal must be obtained from the relevant Competent Authority prior to the cutting or clearing the affected species; 5. The Final Environmental Audit Report shall confirm that all identified species have been rescued and replanted; 6. Debris through vegetation clearing shall not be burned under any circumstances; 7. Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and debris; 8. The use of herbicides shall be in compliance with the terms and conditions of The Fertilisers, Farm, Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947); 9. Only a registered pest control operator may apply herbicides on a commercial basis and commercial application shall be carried out under the supervision of a registered pest control operator, supervision of a registered pest control operator or is appropriately trained; 10. A register shall be kept of all relevant details of herbicide usage as stipulated in Act 36 of 1947;	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

11. Trees, shrubs, grass, natural features and topsoil which are not removed during vegetation clearance shall be protected from damage during operation of the project; 12. All protected species and sensitive vegetation not removed must be clearly marked and such areas fenced off if required in accordance with No-Go procedure in Section 6.10.3: No-Go areas. 13. Alien vegetation on-site shall be managed in terms of the GNR 1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983; 14. Alien invasive vegetation should be removed immediately (in line with relevant municipal and provincial procedures, guidelines and recommendations) and disposed of at a licenced waste disposal facility.					

B.11 Protection of Fauna

Management Objective: Ensure care is taken to minimise disturbance to fauna during construction and potential future impact during the operation of the project.					
Management Outcome: Impact to fauna is avoided during construction and mitigated during operation.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Construction activities shall not interfere or cause fatalities to animals (both wild and farm animals) as stipulated by Environmental Conservation Act 73 of 1989; 2. The breeding sites of raptors and other wild birds species in close proximity to the site must be taken into consideration during the planning of the construction programme; 3. Breeding sites shall be kept intact and disturbance to breeding birds shall be avoided. Special care shall be taken where nestlings or fledglings are present; 4. Special recommendations of the faunal specialist must be adhered to at all times to prevent unnecessary disturbance of fauna; 5. No poaching must be tolerated under any circumstances. All animal dens in close proximity to the works areas must be marked as No-Go areas.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.12 Protection of Heritage Resources

Management Objective: Prevent damage and destruction to fossils, artefacts and materials of heritage significance		
Management Outcome: Impact to heritage resources is avoided		
Impact Management Actions	**Implementation**	**Monitoring**

	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Identify, demarcate and prevent impact to all known sensitive heritage features on site in accordance with the No-Go procedure in Section B.3: No-Go areas; 2. Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance; 3. All work must cease immediately, if any human remains and/or other archaeological, palaeontological and historical material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist (or the South African Police Services), so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to remove/collect such material before construction recommences.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.13 Safety of the Public

Management Objective: Reasonable measures are taken to ensure the safety of the public at all times during construction.					
Management Outcome: All precautions are taken where possible to minimise the risk of injury, harm or complaints.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc.; 2. All unattended open excavations shall be adequately fenced or demarcated; 3. Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding; 4. Ensure structures vulnerable to high winds are secured; 5. Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.14 Sanitation

Management Objective: An abundant supply of suitably located, clean and well maintained toilet facilities are available to all staff in an effort to minimise the risk of disease and impact to the environment.		
Management Outcome: No pollution or disease arises on-site as a result of sanitation facilities or lack thereof.		
Impact Management Actions	**Implementation**	**Monitoring**

	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Mobile chemical toilets are installed onsite if no other ablution facilities are available; 2. The use of ablution facilities and or mobile toilets shall be used at all times and no indiscriminate use of the veld for the purposes of ablutions shall be permitted under any circumstances; 3. Ablution facilities shall be located within 100 m of any work place and shall be numerous enough to accommodate the workforce (minimum requirement of 1:15 workers on site). 4. Where mobile chemical toilets are required, the following shall be ensured: a) Toilets are located no closer than 100 m to any watercourse or water body; b) Toilets are secured to the ground to prevent them from toppling due to wind or any other cause; c) No spillage occurs when the toilets are cleaned or emptied and the contents are managed in accordance with the EMPr; d) Toilets have an external closing mechanism and are closed and secured from the outside when not in use to prevent toilet paper from being blown out; e) Toilets are emptied before long weekends and workers holidays, and shall be locked after working hours; f) Toilets are serviced regularly and the ECO must inspect toilets to ensure compliance to health standards; 5. A copy of the waste disposal certificates shall be maintained.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.15 Prevention of Disease

Management Objective: All necessary precautions linked to the spread of disease during construction are taken.					
Management Outcome: The risk of the occurrence and spread of disease is minimised through the effective implementation of EMPr actions.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Undertake environmentally-friendly pest control in the camp area; 2. Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS; 3. The Contractor shall ensure that information posters on AIDS are displayed in the Contractor Camp area; 4. Information and education relating to sexually transmitted diseases to be made available to both construction workers and local community, where applicable; 5. Medical support shall be made available; 6. Provide access to Voluntary HIV Testing and Counselling Services.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.16 Emergency Procedures

Management Objective: Emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies.					
Management Outcome: All emergency situations are managed in accordance with the emergency procedures.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Compile an Emergency Response Action Plan (ERAP) prior to the commencement of the proposed project; 2. The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation; 3. All staff shall be made aware of emergency procedures as part of environmental awareness training; 4. The relevant local authority shall be made aware of a fire as soon as it starts; 5. In the event of emergency necessary mitigation measures to contain the spill or leak shall be implemented (see Hazardous Substances section B.17).	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.17 Hazardous Substances

Management Objective: To minimise the risk of impact to the environment through the safe storage, handling, use and disposal of hazardous substances.					
Management Outcome: The management of hazardous substances is undertaken in accordance with the Hazardous Substances Act of 1973 (Act No. 15 of 1973), the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry, 1998) and Farm Feeds, Agricultural Remedies and Stock Remedies Act of 1947 (Act No. 36 of 1947) and National Environmental Management: Waste Act of 2008.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. The Occupational Health and Safety Act No 85 of 1993 to be complied with at all times; 2. The use and storage of hazardous substances to be minimised and non-hazardous and non-toxic alternatives substituted where possible; 3. All hazardous substances will be stored in suitable containers as defined in the Method Statement; 4. Containers will be clearly marked to indicate contents, quantities and safety requirements. 5. All storage areas will be bunded. The bunded area will be of sufficient capacity to contain a spill / leak from the stored containers; 6. An Alphabetical Hazardous Chemical Substance (HCS) control sheet will be drawn up and kept up to date on a continuous basis. All hazardous chemicals that will be used on site will have Material Safety Data Sheets;	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

7. All employees working with HCS will be trained in the safe use of the substance and according to the safety data sheet; 8. Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment (PPE) must be made available; 9. The Contractor shall ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers; 10. The tanks/ bowsers shall be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall); 11. The floor of the bund shall be sloped, draining to an oil separator; 12. Provision shall be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray shall be used to ensure small spills are contained; 13. All empty externally dirty drums shall be stored on a drip tray or within a bunded area; 14. No unauthorised access into the hazardous substances storage areas shall be permitted; 15. No smoking shall be allowed within the vicinity of the hazardous storage areas; 16. Adequate fire-fighting equipment shall be made available at all hazardous storage areas; 17. Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit shall be used. Appropriate ground protection such as drip trays shall be used as well; 18. An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance shall be available at all times; 19. The responsible operator shall have the required training to make use of the spill kit in emergency situations; 20. In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008. Refer to Section B.7 for procedures concerning waste water management and B.8 for solid waste management.					

B.18 Workshop, Equipment Maintenance and Storage

Management Objective: The control operation, maintenance and storage of equipment prevents soil, surface water and groundwater contamination					
Management Outcome: Soil, surface water and groundwater contamination is prevented as due to adherence of EMPr requirements					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance

1. Where possible and practical all maintenance of vehicles and equipment must take place in the workshop area; 2. During servicing of vehicles or equipment, especially where emergency repairs are effected outside the workshop area, a suitable drip tray must be used to prevent spills onto the soil; 3. Leaking equipment must be repaired immediately or be removed from site to facilitate repair; 4. Workshop areas must be monitored for oil and fuel spills and such spills; 5. Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place shall be available; 6. The responsible operator of equipment must have the required training to make use of the spill kit in emergency situations; 7. The workshop area shall have a bunded concrete slab that is sloped to facilitate runoff into a collection sump or suitable oil / water separator where maintenance work on vehicles and equipment can be performed; 8. Water drainage from the workshop are shall be contained and managed in accordance Section B.7: Waste water management	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.19 Batching Plants

Management Objective: To control concrete and cement batching activities in order to prevent spillages and concomitant contamination of soil, surface water and groundwater environment.					
Management Outcome: The management, handling and storage of sand, stone and cement is undertake in accordance with the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Concrete mixing shall be carried out on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface); 2. Concrete mixing areas must be fitted with a containment facility for the collection of cement laden water. This facility must be impervious to prevent soil and groundwater contamination; 3. Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains; 4. A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted; 5. Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility; 6. Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site in appropriate containers; 7. Sand and aggregates containing cement must be kept damp to prevent the generation of dust (Refer Section to B.20: Dust emissions)	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

8. Any excess sand, stone and cement must be removed from site on completion of construction period and disposed at a registered disposal facility if it cannot be reused; 9. Temporary fencing shall be erected around batching plants in accordance with Section B.5: Fencing and gate installation.					

B.20 Dust Emissions

Management Objective: To reduce dust emissions during construction activities.					
Management Outcome: Minimal occurrence of dust due the adherence of EMPr requirements.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the ECO; 2. Removal of vegetation shall be avoided until such time as soil stripping is required and similarly exposed surfaces shall be re-vegetated or stabilised as soon as is practically possible; 3. Excavation, handling and transport of erodible materials shall be avoided under high wind conditions or when a visible dust plume is present; 4. During high wind conditions, the ECO will evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level; 5. Where possible, soil stockpiles shall be located in sheltered areas where they are not exposed to the erosive effects of the wind. Where erosion of stockpiles becomes a problem, erosion control measures shall be implemented at the discretion of the ECO; 6. Vehicle speeds shall not exceed 40km/h along dust roads or 20km/h when traversing unconsolidated and non-vegetated areas; 7. Appropriate dust suppression measures shall be used when dust generation is unavoidable, e.g. dampening with water, particularly during prolonged periods of dry weather in summer. Such measures shall also include the use of temporary stabilising measures (e.g. chemical soil binders, straw, brush packs, chipping); 8. Any blasting to be done after informing local public; 9. Any blasting activity shall be conducted by a suitably licensed blasting contractor; 10. For significant areas of excavation or exposed ground, spray water or wet areas using trucks to minimise the spread of dust.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.21 Noise

Management Objective: To prevent unnecessary noise to the environment by ensuring that noise from construction activity is mitigated.					
Management Outcome: Noise management is undertaken in accordance with SANS 10103 and requirements of the EMPr.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Operating hours as determined by the environmental authorisation are adhered to during the construction phase. Where not defined, construction shall be limited to daylight hours; 2. Conduct noise monitoring tests, as required by the ECO or environmental authorisation; 3. Noise levels are to comply with ECA's 7dB rule i.e. cannot generate noise that increases the noise levels to 7db above the current ambient.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.22 Fire Prevention

Management Objective: To minimise the risk of fire during construction					
Management Outcome: Fire prevention measures are carried out in accordance with the National Veld and Forest Fire Act, 101 of 1998					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Designate smoking areas where the fire hazard could be regarded as insignificant; 2. Educate workers on the dangers of open and/or unattended fires; 3. No open fires shall be allowed on site under any circumstances; 4. Firefighting equipment shall be available on all vehicles located on site; 5. The local Fire Protection Agency (FPA) must be informed of construction activities; 6. Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.23 Stockpiling and Stockpile Areas

Management Objective: To reduce potential erosion and sedimentation as a result of stockpiling of materials

Management Outcome: Stockpiling management is undertaken in accordance with the requirements of the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All material that is excavated during the construction phase (either during piling (if required) or earthworks) shall be stored appropriately on site in order to minimise impacts to watercourses, wetlands and water bodies; 2. Stockpiles must be located at least 10 m away from storm water channels and drains, and at least 32 m away from any watercourse, water body or wetland, and on flat areas where runoff will be minimise; 3. All stockpiled material shall be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods; 4. Stockpiles shall not exceed 2 m in height; 5. During periods of strong winds and heavy rain, the stockpiles should be covered with appropriate material (e.g. cloth, tarpaulin etc.); 6. Where possible, sandbags (or similar) should be placed at the bases of the stockpiled material in order to prevent erosion of the material.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.24 Civil Works

Management Objective: Impact to the environment to be minimised during civil works. **Management Outcome**: Impact to the environment is minimised through adherence to EMPr requirements.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Where terracing is required, topsoil must be collected and retained for the purpose of re-use later to rehabilitate disturbed areas; 2. Where required, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled; 3. These areas can be stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly; 4. Rehabilitation of the disturbed areas shall be managed in accordance with Section B.30: Landscaping and rehabilitation; 5. Any blasting activities must be controlled and executed by a licensed person. Blasting activities must be well communicated with nearby communities;	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

6. All excess spoil generated during terracing activities must be disposed of in an appropriate manner and at a legally operated landfill site; 7. Spoil can however be used for landscaping purposes and must be covered with a layer of 150mm topsoil for rehabilitation purposes; 8. Under no circumstances may any illegal / hazardous substances or materials be dumped with topsoil and used during landscaping.					

B.25 Excavation of Foundation, Cable Trenching and Drainage Systems

Management Objective: Impact to the environment to be minimised during the excavation of foundations					
Management Outcome: Impact to the environment is minimised through adherence to EMPr requirements					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All excess spoil generated during foundation excavation must be disposed of in an appropriate manner and at a legally operated landfill site, if not used for backfilling purposes; 2. Spoil can however be used for landscaping purposes and must be covered with a layer of 150mm topsoil for rehabilitation purposes; 3. Management of equipment for excavation purposes shall be undertaken in accordance with Section B.18: Workshop equipment maintenance and storage; 4. Hazardous substances spills from equipment shall be managed in accordance with Section B.17: Hazardous substances.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.26 Installation of Foundations, Cable Trenching and Drainage Systems

Management Objective: Impact to the environment to be minimised during the installation of foundations, cable trenching and drainage systems					
Management Outcome: Impact to the environment is minimised through adherence to EMPr requirements					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance

1. Batching of cement to be undertaken in accordance with Section B.19: Batching; 2. Residual solid waste shall be recycled or disposed of in accordance with Section B.8: Solid Waste Management.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.27 Steelwork Assembly and Erection

Management Objective: Impact to the environment to be minimised during steelwork assembly and erection					
Management Outcome: Impact to the environment is minimised through adherence to EMPr requirements					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. During assembly, care must be taken to ensure that no wasted/unused materials are left on site e.g. bolts and nuts 2. Emergency repairs due to breakages of equipment shall be managed in accordance with Section B. 18: Workshop equipment maintenance and storage and Section B.16: Emergency procedures.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.28 Temporary Site Closure

Management Objective: Minimise the risk of environmental impact during periods of site closure greater than five days					
Management Outcome: Site closure procedures are implemented in accordance with the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Bunds shall be emptied (where applicable); 2. Hazardous storage areas shall be well ventilated; 3. Fire extinguishers shall be serviced and accessible; 4. Emergency and contact details displayed shall be displayed;	Contractor	Construction	Monitor compliance and record	Monthly	ECO and Project Developer

5. Fencing and barriers shall be in place as per the Occupational Health and Safety Act (No 85 of 1993); 6. Security personnel shall be briefed and have the facilities to contact or be contacted by relevant management and emergency personnel; 7. Night hazards such as reflectors, lighting, traffic signage etc. shall have been checked; 8. Fire hazards identified and the local authority shall have been notified of any potential threats e.g. large brush stockpiles, fuels etc.; 9. Stockpiles shall be appropriately secured; 10. Structures vulnerable to high winds shall be secured; 11. Wind and dust mitigation shall be implemented; 12. Cement and materials stores shall have been secured; 13. Toilets shall have been emptied and secured; 14. Refuse bins shall have been emptied and secured; 15. Drip trays shall have been emptied and secured.			non-compliance and incidents.		

B.29 Dismantling of Old Equipment

Management Objective: Impact to the environment to be minimised during the dismantling, storage and disposal of old equipment commissioning					
Management Outcome: Site closure procedures are implemented in accordance with the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All old equipment removed during the project must be stored in such a way as to prevent pollution of the environment; 2. Oil containing equipment must be stored to prevent leaking or be stored on drip trays; 3. All scrap steel must be stacked neatly and any disused and broken insulators must be stored in containers; 4. Once material has been scrapped and the contract has been placed for removal, the disposal Contractor must ensure that any equipment containing pollution causing substances is dismantled and transported in such a way as to prevent spillage and pollution of the environment; 5. The Contractor must also be equipped to contain and clean up any pollution causing spills; 6. Disposal of unusable material must be at a registered waste disposal site and a certificate of disposal must be obtained and copied to the developer.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

B.30 Landscaping and Rehabilitation

Management Objective: Areas disturbed during construction are returned to a state that approximates the state which they were before disruption					
Management Outcome: Landscaping and rehabilitation is in undertaken in accordance with the approved rehabilitation plan/specification					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All areas disturbed by construction activities shall be subject to landscaping and rehabilitation; 2. All spoil and waste will be removed to a registered waste site and certificates of disposal provided; 3. All slopes in excess of 2% (1:50) must be contoured in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; 4. All slopes in excess of 12% (1:8.3) must be terraced in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; 5. Rehabilitation of project sites shall be undertaken in accordance with civil designs; 6. Indigenous species will be used for replanting; 7. Stockpiled topsoil shall be used for rehabilitation (refer to Section B.23: Stockpiling and stockpiled areas); 8. Stockpiled topsoil will be evenly spread so as to facilitate seeding and minimise loss of soil due to erosion; 9. Before placing topsoil, all visible weeds from the placement area and from the topsoil shall be removed. 10. Subsoil shall be ripped before topsoil is placed. 11. The project shall be timed so that rehabilitation can take place at the optimal time for vegetation establishment. 12. Where impacted through construction related activity, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled as per the instruction from the ECO. 13. Sloped areas stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly; 14. Where required, re-vegetation can be enhanced using a vegetation seed mixture as described below. A mixture of seed can be used provided the mixture is carefully selected to ensure the following: a) Annual and perennial plants are chosen. b) Pioneer species are included. c) Species chosen must grow in the area without any problems. d) Root systems must have a binding effect on the soil. e) The final product should not cause an ecological imbalance in the area.	Contractor	Construction	Monitor compliance and record non-compliance and incidents.	Monthly	ECO and Project Developer

SECTION 2: PROJECT SPECIFIC ENVIRONMENTAL CONTROLS

2.1 Description of Project

Proposed Shopping Centre Development on A Portion of Erf 440 and A Portion of Erf 488, Brentwood Extension 1 within the City of Ekurhuleni

The subject site comprises of a Portion of Erf 440 and Erf 488, Brentwood Extension 1, which as a whole is approximately 5 ha in extent. It is proposed to consolidate the two erven in order to enable the single shopping centre development. It has become the intention of the developer to develop a reduced shopping centre with a maximum extent of about 9,500 m² GLA. The proposed shopping centre will be the size of a typical neighbourhood centre.

The centre will cater for the surrounding residential areas, but which is also expected to attract some of the passing traffic, especially from Great North Road.

In terms of the current zoning, the following can be noted:

- Portion of Erf 440, Brentwood Ext 1: The current zoning is "Residential 3". It is proposed to rezone the site to "Special" in order to develop the proposed shopping centre.
- Erf 488, Brentwood Ext 1: This site already has business rights, which would allow for shops.

It is the intension to consolidate the two erven with the rezoning. To note is that due to the flood lines and environmentally sensitive areas, only a portion of the 5 ha site can be developed, and which would limit the developer to the 9,500m² GLA, especially if one takes account of the space required for the parking.

A provisional Site Development Plan (SDP) of the architect is shown in Figure 1.

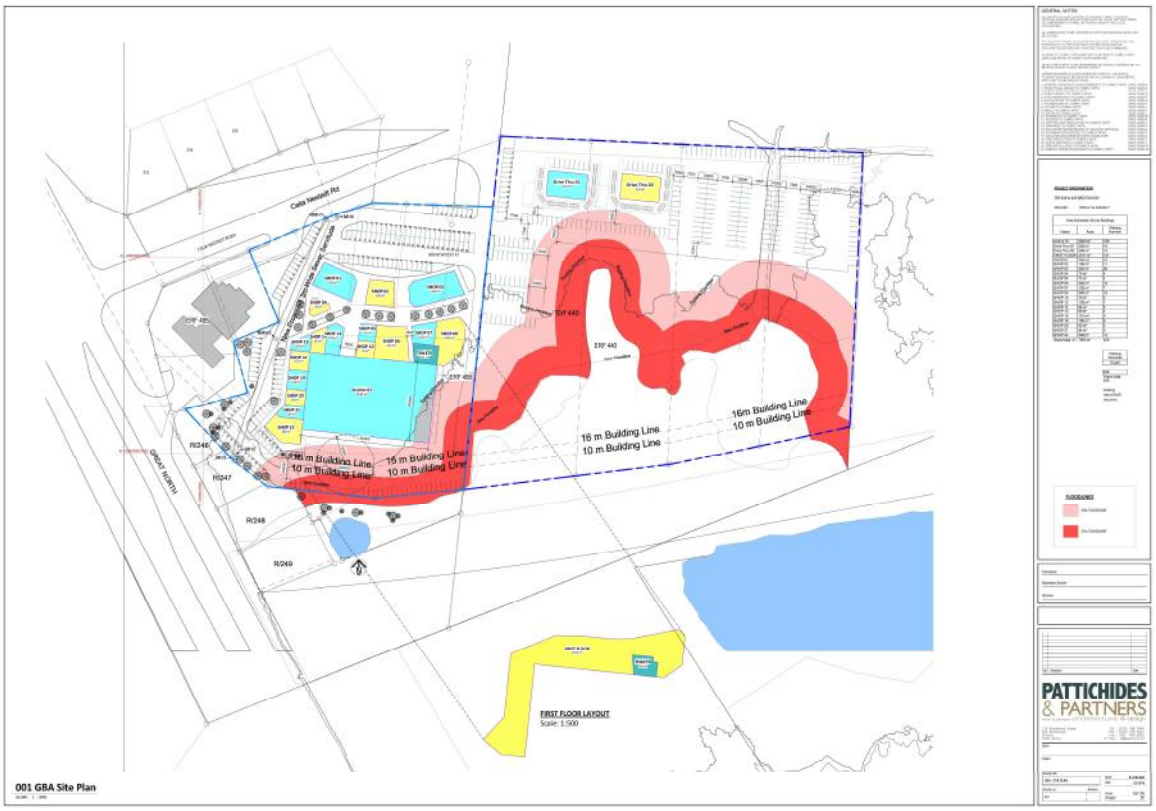

Figure 1: Proposed Site Development Plan

2.2 Project Design and Project Specific Information and Mitigation Requirements

Impact 1: Vegetation Clearing

Most of the natural occurring indigenous vegetation within the proposed development footprint will be permanently lost due to development. The site is largely degraded and habitat has been transformed, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat.

The wetland associated areas will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the compromised area.

Mitigation

- The wetland must be protected by means of a 15 meter conservation buffer where no development is allowed as recommended in the wetland specialist report.
- Stilts and other features could be considered for the shopping centre and this will preserve the remaining functioning of the wetland unit where possible, since the wetland is no longer deemed functional and in good ecological health.
- Development planning must ensure loss of vegetation and disturbance is restricted to within the recommended development layout footprint.
- The construction area should be clearly demarcated and no activity or disturbance to vegetation must be permitted outside of the demarcated site area.
- Open space areas allocated within the site must be adequately maintained to allow for continuance of ecological functionality and persistence of biodiversity.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Only indigenous vegetation is to be planted in site rehabilitation and in landscaping activities within the development.
- Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment.
- Alien invasive species identified on site should be removed (prioritising category 1 species) prior to construction.
- Regular cleaning up of the wetland areas should be undertaken to remove litter.

Impact 2: Introduction and Increase in Alien Vegetation

Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas.

Mitigation

- Alien invasive species identified on site should be removed (prioritising category 1 species) prior to construction.
- Manual or mechanical removal should be done as opposed to chemical removal.
- Implement an Alien and Invasive Management Programme, which will aim to remove and manage the plants recorded during the field survey, since most of these species are already listed on the Alien and Invasive Species list as published in 2016 (Department of Environmental Affairs, 2016).
- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.

Impact 3: Impacts on the Wetland, Soil and Water Resources

Impacts on the wetland and water resources located downstream of the transformed wetland system. Potential soil and water contamination as a result of construction activities.

Spillage of contaminants (such as cement-mix, oil, lubricants and fuel) from vehicles and construction activities (such as cement mixing, plant and vehicles maintenance, and other machinery) during construction could potentially impact on soils and groundwater.

Erosion - Clearing of the site will expose soil surfaces, which may increase the risk of soil erosion during the construction phase. Uncontrolled storm water runoff may further exacerbate the risk of erosion.

Wetland Mitigation

- Ensure that no construction is planned within the sensitive environment (wetland and 15 meter conservation buffer). The wetland and associated buffer will be demarcated as no-go areas.
- Adhere to all management and mitigation measures as prescribed within the wetland specialist report.
- No excavation or construction shall be permitted within the 1:100 year flood line or wetland delineation (whichever is the greatest) without prior approval from the Competent Authority (DWS or Catchment Management Agency) in the form of a water use authorisation.
- Include environmental awareness aspects into the site induction program to ensure all staff are aware of the location and importance of wetland habitats on site.
- Regular cleaning up of the wetland areas must be undertaken to remove litter.
- Establish emergency response measures and a clearly defined chain of communication to rapidly deal with any unforeseen impacts to wetland, e.g. spills.
- Ensure proper stormwater management and maintenance of this system. Stormwater management will prevent impacts reaching the natural environment.

Soil Mitigation

- All items related to construction including site camp and stockpiles are to be kept within the confines of the property.
- During construction phase, all soil stockpiles must be located on level areas, which are not susceptible to erosion and at a suitable distance from drainage areas.
- Soil stockpiles must not exceed 1.5 m in height and should not be stored for longer than 6 months. If alien material sprouts in stockpiles, this must be removed immediately.
- All construction equipment must be in good working order, especially with respect to leaks of oil, fuel or hydraulic fuels.
- Any contaminated soil must be removed from the construction area and disposed of at registered waste disposal sites.
- During construction appropriate waste control, recycling and waste removal systems must be installed to prevent pollution of the soil.
- A defined parking area must be demarcated for vehicles and vehicle movement should be restricted to the minimum necessary for the construction activities. Re-fueling of vehicles must be restricted to the site camp and must only be done on impervious surfaces.
- Drip-trays must be provided beneath standing vehicles and machinery, and routine checks should be done to ensure that these are in a good condition.
- Mixing of cement must be done on impervious surfaces only.
- All vehicle activity must be confined to the existing access tracks.

Surface & Groundwater

- The Contractor must ensure that no contaminated surface water flows off-site as a result of Contractor operations. Silt traps must be constructed to ensure retention of silt on site and cut-off ditches shall be constructed to ensure no runoff from the site except at points where slit traps are provided.
- No rock, silt, cement, grout, asphalt, petroleum product, timber, vegetation, domestic waste, or any deleterious substance should be placed or allowed to disperse into any drainage line.

- Ensure all construction equipment is free of leaks from oil, fuel or hydraulic fuels. No construction vehicles should be cleaned on site. Re-fueling of vehicles must only occur within the confines of the site camp on an impervious surface.
- Mixing of cement must only be done on impervious surfaces.
- Concrete mixing areas must be fitted with a containment facility for the collection of cement laden water. This facility must be impervious to prevent soil and groundwater contamination.
- Runoff from the cement/ concrete batching areas shall be strictly controlled, and contaminated water shall be collected, stored and either treated or disposed of off-site.
- No building material and/or remnants of cement must be left on site.
- Chemical toilets must be made available to construction staff.

Erosion

- The extent of the disturbance will influence the risk and consequences of erosion at the site. It is advisable to undertake construction in a phased manner, so as to limit the size of the area to be exposed at any one time. The minimum amount of vegetation should be removed from the individual construction sites.
- Until re-vegetation is successful, temporary stabilization measures must be used to prevent erosion. These can include the use of gravel bags, straw and other matting materials, hay bales, siltation fences, sedimentation basins, grassy swales, hydro-seeding, and straw mulching.
- Construction activities and vehicles should not be allowed outside the fenced/demarcated area indicated for construction.

Impact 4: Stormwater Discharge / Waste Pollution

Storm water discharge points may result in potential disturbance and negative impact upon wetland zones and wetland vegetation.

Stormwater and downstream surface watercourses could be contaminated as a result of minor spillages of hydrocarbons (oils, diesel, etc.) or leakage of such substances from construction machinery that enter watercourses through surface runoff during rainfall events or subsurface movement (through groundwater) and then migrate to downstream systems.

- The wetland areas must be protected by means of a 15 meter conservation buffer where no development is allowed.
- Construction camps, storage areas, soil stockpile areas and laydown areas must be located above the new 1:100 year flood line and/or the 15 meter buffer line, whichever is the greatest distance.
- Design and implement a storm water management plan that aims to minimise the concentration of flow and increase in flow velocity, as well as minimising sediment transport off site.
- Efficient drainage must be provided on site prior to construction.
- Site drainage must prevent ponding near structures and roads, and ensure that uncontrolled surface run-off does not encourage unwanted surface erosion and scour. Recommendations contained within the engineer's report with regards to stormwater control and erosion prevention must be implemented throughout the lifespan of the project.
- Initiate replanting of disturbed areas immediately after construction is completed to minimise any excess runoff.
- Managed storm water discharge points that have energy dissipating measures implemented at each point.
- Spillages should be cleaned up immediately and contaminants properly drained and disposed of using appropriate waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the construction site must be removed and disposed of appropriately.
- Any cement batching activities should occur in the construction camp and conducted on an impermeable surface. Cement products/ wash may not be disposed of into the natural environment.

Stormwater Management Conditions for Discharge into a Stream - Discharge of stormwater into a wetland shall be subject to at least the following conditions:

- The discharge water shall be routed through an energy dissipating structure or stilling basin such that the velocity of the discharge water is reduced to a value between 0,8 m/s and 1,0 m/s (or less) depending on the soil conditions at the point of discharge; it is up to the designer to substantiate the design parameters by submitting soil test results;
- The energy dissipating structure shall be constructed in such a way that it will accommodate flow conditions in the stream, depending on the level of discharge;
- The outlet structure shall be provided with an appropriate upstream apron dipped against the direction of flow as well as a key on the downstream side;
- The energy dissipating elements shall be positioned such that the anticipated flow for a 1 in 25 year event in the stream is not interfered with;
- Texturing of the outlet structure elements that extend beyond the 1 in 25 year event is to be provided such that nearest compatibility with the natural watercourse is achieved;
- The angle of discharge will not be greater than 30º relative to the average direction of flow established over a distance of 20 m upstream of the point of discharge;
- The resultant gradient between the point of discharge in the direction of flow and that of the bed of the stream shall such that it complies with the velocity restriction stated above;
- Segmented material used in the outlet structure shall be adequately anchored;
- Existing vegetation shall be reinstated where disturbed during construction;
- Install silt and litter traps as part of the Stormwater Management System, where required. The silt and litter traps must be monitored and well maintained (i.e. regularly cleaned etc.). Maintenance requirements should be included in the Stormwater Management Plan. Erosion and sedimentation into water bodies must be minimised through effective stabilisation (such as silt traps, gabions and Reno mattresses) and re-vegetation of any disturbed areas.

2.2.1 Conditions of EA and Mitigation Measures

[To Be Completed By EAP once EA is granted]

Conditions of the Authorisation

(i) Any decision regarding the granting of authorisation of this activity should also be subject to the implementation of all the mitigation and management recommendations as contained in the EMPr.
(ii) An Environmental Management Programme (EMPr) has been compiled and can be found under Appendix H of this document. It is recommended that an Environmental Control Officer be appointed to conduct independent audits to ensure compliance with the EMPr during construction.
(iii) The wetland must be protected by means of a 15 meter conservation buffer where no development is allowed as recommended in the wetland specialist report.
(iv) The wetland and associated 15 meter conservation buffer will be demarcated as no-go areas.
(v) A Water Use License must be applied for, for impeding and diverting the flow of a water course (Section 21 (c)) and altering the bed, banks, course and characteristics of a watercourse (Section 21(i)) for the construction of the shopping centre and associated infrastructure within the 1:100 year flood line regulated area.
(vi) A stormwater management plan must be developed and approved for the proposed development by the relevant authorities before construction commences. This plan must make provision for trapping pollutants before the water is released into the wetland and also make provision that the force of the water is broken before releasing it into the system. In addition the water should be released at various points so as to prevent large-scale erosion.
(vii) The design and implementation of the infrastructure and services provision are to be done in accordance with engineering specifications so as to comply with the regulations and standards of the City of Ekurhuleni Metropolitan Municipality.
(viii) The construction of all structures, roads and implementation of services must be in accordance with the specifications of the geotechnical engineering assessment. Such specification will be in response to site specific soil characteristics, gradient and anticipated runoff.

PART C: APPENDICES

APPENDIX A: METHOD STATEMENTS

[TO BE COMPLETED AND UPDATED BY CONTRACTOR ON A PROJECT BY PROJECT BASIS]

APPENDIX I: OTHER