Lotso la Badiri Trading & Projects

DRAFT BIODIVERSITY ASSESSMENT

FOR THE PROPOSED DEVELOPEMNT OF AN INTERGRATED HUMAN SETTLEMENT IN THE JB MARKS LOCAL MUNICIPALITY IN THE NORTH WEST PROVINCE

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EXECUTIVE SUMMARY

Lotso La Badiri Trading and Projects has been appointed by Lesekha Consulting as an independent Environmental Assessment Practitioner (EAP) to undertake the biodiversity Study in order to advise the project on biological and environmental sensitivities surrounding the proposed Integrated Human Settlement project. The major aim of this document is to elaborate on the perceived sensitivity of the receiving environment based on a brief site investigation and results of a desktop assessment of available information, informing the project with regards to potential fatal flaws, opportunities and constraints.

The proposed project site is situated within a CBA Category 1 area, comprising of conservation important species Category 1 areas as outlined to have the following:

- Ecosystems and species fully intact and undisturbed.
- These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern.
- Targets. If the biodiversity features targeted in these areas are lost then targets will not be met.
- These are landscapes that are at or past their limits of acceptable change.

Ideally, these parts of the landscape need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity capability of the areas is lost and the conservation targets cannot be met. For CBAs the impact on biodiversity of a change in land-use that results in a change from the desired ecological state is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g. loss of a populations or habitat.

Although the area is a CBA type 1 the site is disturbed by the establishment of informal settlements and pollution from illegal waste dumping and the sewage water on the periphery of the development site. There is need to clean up, rehabilitate delineate the wetland so as to restore ecological function, the municipality should ensure that further pollution of the wetland is curbed by preventing the sewerage water from gaining ingress

into the wetland. A buffer of 50m must be allowed from the wetland were no development is allowed and the wetland area must be fenced.

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ABREVIATIONS AND ACRONYMS

BGIS	Biodiversity Information System
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
EMPR	Environmental Management Program Report
ENPAT	Environmental Potential Atlas
ESH	Environmental Safety and Health
GA	General Authorization
GIS	Geographic Information System
GN	Government Notice
I&AP	Interested and/or Affected Parties
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IUCN	International Union for Conservation of Nature
IWULA	Integrated Water Use License Application
JBLM	JB Marks Local Municipality
LED	Local Economic Development
MSA	Municipal Service Act
NDP	National Development Plan
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act (No. 107 of 1998) (as amended)
NEMAA	National Environmental Management Amendment Act
NEMWA	National Environmental Management: Waste Act (No. 59 of 2008)

NHRA	National Heritage Resources Act (No. 25 of 1999)
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act (No. 36 of 1998)
NWPBCA	North West Province Biodiversity Conservation Assessment
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency
SANBI	South Africa National Biodiversity Institute
SANS	South Africa National Standards
SDF	Spatial Development Framework
SDI	Spatial Development Initiative
SEA	Strategic Environmental Assessment
SEMP	Strategic Environmental Management Plan
SPLUMA	Spatial Planning and Land Use Management Act
ToR	Terms of Reference

GLOSSARY

Aquatic critical biodiversity areas	(ACBA) means linkages between catchment, important rivers and sensitive estuaries whose safeguarding is critically required in order to meet biodiversity pattern and process thresholds and are spatially defined as part of a bioregional plan or systematic biodiversity plan.
Biodiversity	The number and variety of living organisms on earth, the millions of plants, animals, and micro-organisms, the genes they contain, the evolutionary history and potential they encompass, and the ecosystems, ecological processes, and landscapes of which they are integral parts.
Biodiversity feature	An element of biodiversity for which it is possible to set a quantitative conservation target, for example a vegetation type, a species or the spatial component of an ecological process.
Biodiversity pattern	The structure and composition of ecosystems
Biodiversity planning	Describes biodiversity conservation planning for regions defined using biological criteria.
Biodiversity process	Ecological processes and functions that sustain biodiversity
Biome	A broad ecological unit representing major life zones of large natural areas or the biological component of a large geographic region. Biomes are usually characterised by characterized by its distinctive vegetation and maintained by local climatic conditions.
Buffer zones	Areas of land in which development is strictly controlled.
Channel	(river, including the banks) - an open conduit with clearly defined margins that (i) continuously or periodically contains flowing water. Dominant water sources include concentrated surface flow from upstream channels and tributaries, diffuse surface flow or interflow, and/or groundwater flow.

Channelled valley-bottom wetland	A mostly flat valley-bottom wetland dissected by and typically elevated above a channel (see channel). Dominant water inputs to these areas are typically from the channel, either as surface flow resulting from overtopping of the channel bank/s or as interflow, or from adjacent valley-side slopes (as overland flow or interflow).
Climate Change	Refers to the variation in the Earth's global climate or in regional climates over time. It describes changes in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. These changes can be caused by processes internal to the Earth, external forces (e.g. variations in sunlight intensity) or, more recently, human activities.
Conservation	The management of human use of the biosphere so that it may yield the greatest sustainable benefit to current generation's while maintaining its potential to meet the needs and aspirations of future generations: Thus conservation is positive, embracing preservation, maintenance, sustainable utilisation, restoration, and enhancement of the natural environment
Conservation action	Includes but is not limited to the establishment or expansion of protected areas. Conservation action should include engaging with all major landowners and land-users across a range of socio-economic sectors, to increase awareness of priority areas for meeting conservation targets and to ensure that land management and land-uses in these priority areas support biodiversity conservation
Conservation assessment	The development of spatial data layers and the spatial analysis undertaken to identify options for meeting conservation targets. Conservation assessments should include the interpretation of this analysis for a wide range of stakeholders and evolutionary processes that sustain them. Conservation Planning involves conservation assessment plus the development of an

	implementation strategy and action plan.
Conservation planning	Planning at a range of spatial scales that aims to identify areas for biodiversity conservation, taking into account patterns of biodiversity and the ecological**.**
Critical Biodiversity Areas	(CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses
Degradation	The lowering of the quality of the environment through human activities, e.g. river degradation, soil degradation.
Delineation (of a wetland or riparian zone):	To determine the boundary of a water resource (wetland or riparian area) based on soil and vegetation (wetland) or geomorphological and vegetation (riparian zone) indicators.
Ecological processes	Ecosystems work because they are kept alive by ecological processes such as pollination, nutrient cycling, disturbance (e.g. fire), and migration of species or soil maintenance. Ecological processes typically only functions well where natural vegetation remains, and in particular where the remaining vegetation is well connected with other nearby patches of natural vegetation. Loss and fragmentation of natural habitat severely threatens the integrity of ecological processes.
Ecology	The scientific study of the relations that living organisms have with respect to each other and their natural environment.
Ecosystem	The totality of factors of all kinds, living and non-living, which make up a particular environment; the complex of a biotic

	community and its abiotic, physical environment, functioning as an ecological unit in nature. Ecosystems provide direct and indirect benefits to humans, e.g. flood amelioration by naturally functioning wetlands, the oceans' regulation of the chemical composition of the atmosphere, and providing habitat for commercially exploited species
Ecosystem status	Ecosystem status of terrestrial ecosystems is based on the degree of habitat loss that has occurred in each ecosystem, relative to two thresholds: one for maintaining healthy ecosystem functioning, and one for conserving the majority of species associated with the ecosystem. As natural habitat is lost in an ecosystem, its functioning is increasingly compromised, leading eventually to the collapse of the ecosystem and to loss of species associated with that ecosystem.
Floodplain wetland	The mostly flat or gently sloping wetland area adjacent to and formed by a Lowland or Upland Floodplain river, and subject to periodic inundation by overtopping of the channel bank.
Fynbos	Fire-adapted and drought-resistant shrubland largely confined to nutrient-poor soils in the winter rainfall areas of the south-western Cape. Fynbos is the dominant vegetation group of the Cape Floral Kingdom (CFK), one of the world's six floral kingdoms.
Habitat fragmentation	Ecosystems and the species therein, need a certain amount of inter-connectivity for processes to continue. If a specific natural area is broken up into smaller pieces, eventually species disappear and certain functions are lost.
Habitat	The natural home and range of species of plants or animals.
Hill slope seep	A wetland area located on (gentle to steep) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope.

Hydromorphic soil:	A soil that, in its undrained condition, is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobic soils).
Hydroperiod	The term hydroperiod describes the different variations in water input and output that form a wetland, characterising its ecology – i.e. the water balance of the wetland.
Hydrophyte	Any plant that grows in water or on a substratum that is at least periodically deficient in oxygen as a result of soil saturation or flooding; plants typically found in wet habitats.
Inland wetland systems	Inland wetland systems (non-coastal) are ecosystems that have no existing connection to the ocean which are inundated or saturated with water, either permanently or periodically.
Pollution	Pollution", as described by the Act is "the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it", inter alia: "less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful to the welfare" "of human beings, to any aquatic or non-aquatic organisms, or to the resource quality."
Protected area	A legally established land or water area under either public or private ownership that is regulated and managed to achieve specific conservation objectives.
Red Data Book	Contains data on the threat to and rarity of plant and animals species. For each species, data is provided on rarity status, (i.e. endangered, vulnerable, rare, out-of-danger, and indeterminate), geographical distribution, population size, habitat, breeding rate and any conservation measures taken to protect the species.
Rehabilitation	Refers to re-instating the driving ecological forces (including

	hydrological, geomorphological and biological processes) that underlie a wetland, so as to improve the wetland's health and the ecological services that it delivers.
Restoration	The return of an ecosystem or habitat to its original community structure, natural complement of species, and natural functions.
Riparian habitat	The National Water Act defines riparian habitat as: "the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas"
Seasonal zone of wetness	The zone of a wetland that lies between the Temporary and Permanent zones and is characterized by saturation for three to ten months of the year, within 50cm of the surface.
Sustainable development	Development that meets the needs of both present and future development, equitably. In terms of the National Environmental Management Act 107 of 1998, sustainable development is the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations
Temporary wetland zone:	Hygrophilous to semi-terrestrial grassland. Saturated for 3 to 5 months of the year. Dominated by water tolerant grasses and some sedge.
Transformation	Refers to the adverse changes to biodiversity, typically habitats or ecosystems, through processes such as cultivation, forestry, drainage of wetlands, urban development or invasion by alien plants or animals. Transformation results in habitat fragmentation on (i.e. the breaking up of a continuous habitat, ecosystem, or land-

	use type into smaller fragments)
Unchannelled valley-bottom wetland -	A mostly flat valley-bottom wetland area without a major channel running through it, characterised by an absence of distinct channel banks and the prevalence of diffuse flows, even during and after high rainfall events
Water table:	The upper surface of groundwater or that level below which the soil is saturated with water. The water table feeds base flow to the river channel network when the channel bed is in contact with the water table.
Watercourse:	A river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which or from which water flows or any collection of water which the Minister may by notice in the Gazette declare to be a watercourse. A reference to a watercourse includes where relevant, its bed and banks.
Wetlands	A collective term used to describe lands that are sometimes or always covered by shallow water or have saturated soils. Collectively, wetlands and their associated vegetation are highly diverse and productive ecosystems and despite their invaluable social and environmental roles, wetlands have been identified as being among southern Africa's most threatened and neglected habitats

DECLARATION OF INDEPENDENCE

Lotso La Badiri Trading and Projects is fully independent and have no interest in the business nor receive any payment or benefit other than fair remuneration for the task undertaken as required in terms of the regulation. This report has been compiled by Lotso La Badiri Trading and Projects who has an extensive experience in investigating and compiling Environmental Impact Assessment Reports (EIAR). The company has thoroughly investigated impacts that may negatively affect the site, including the fatal flaw and can attest to the information presented on this report as an actual situation at the proposed site.

Mr. Seitlhamo prepared the biodiversity study, he is a qualified Ecologist; He managed and coordinated the Regional Ecologist of the Western parks, ecological services. He holds the BSc (Biology and Geography and Environmental sciences; BSc Honours (Geography and Environmental Science, GIS) and MSc in Environmental Sciences from the University of Witwatersrand.

Mr Seitlhamo holds a certificate in Project Management, Wetland training course from University of Pretoria continuing Education, Fire management tool. Southern Africa College and Vegetation management and monitoring. Mr. Seitlhamo is a professional membership of Grassland Society of Southern Africa (GSAA), Southern African Wildlife Management Association (SAWMA) & IEEE Geo-Science and Remote Sensing Society (GRSS).The acquired qualifications and experience demonstrated that we are uniquely qualified to undertake this Biodiversity Assessment Study.

1. Introduction

Lotso la Badiri Trading and Projects has been appointed by Lesekha Consulting as an independent Environmental Assessment Practitioner (EAP) to undertake the Biodiversity Assessment Study for the Environmental Impact Assessment process for the establishment of an Integrated Human Settlement and related infrastructure on Elandskuil Farm No.205 & 206 IP, in Ventersdorp within the jurisdiction of JB Marks Local Municipality, in the North West Province.

South Africa's globally renowned wealth of biodiversity and ecosystem services underpins and supports our social and economic development. South Africa's Constitution and laws reflect the importance of sustainable development and the need to conserve our biodiversity heritage.

This report gives key information regarding the proximity of the establishment of an Integrated Human Settlement and related infrastructure to high biodiversity areas, including areas with important ecological services and processes, and protected areas. This report also provides a desktop based preliminary and high level assessment of the potential impacts that the proposed development might have on biodiversity and the delineation of the wetland. The report also strives to provide preliminary recommendations to address some of these potential impacts.

Based on the principles of systematic biodiversity planning, this information has been used to identify biodiversity priority areas (or critical biodiversity areas), which are features in the landscape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. The Biodiversity Assessments identify Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state.

1.2 Objective of the study

The objectives of the Biodiversity Assessment study are as follows:

- To conduct wetland delineation and to assess its ecological status in the ecosystem.

- To determine if any fauna and flora species will be directly impacted upon by the proposed Integrated Human Settlement Development and associated infrastructure, this includes fauna and flora communities present, the state of these communities, identification of possible red data species.
- To assess the viability of the development of the Integrated Human Settlement land on the proposed site which is also declared as a CBA as per the North West Biodiversity Sector Plan.

This report gives key information regarding the proximity of the proposed development to high biodiversity areas, including areas with important ecological services and processes, and protected areas.

1.3 Description of the Study Area

The Department of Local Government and Human Settlements is proposing the establishment of Integrated Human Settlement and related infrastructure on Elandskuil. The proposed project is primarily aimed at providing affordable housing to lower income groups and will contribute to alleviating the current housing need in the area. Each housing unit/stand will be provided with electricity, potable water and sanitation. The proposed establishment of an integrated human settlement will entail the following development:

- The development of approximately 3852 housing,
- Provision of open space areas for recreational use as well as for educational purposes;
- Breaking New Grounds (BNG) units,
    - Social housing;
    - Community residential units
    - Rental stock,
    - Pre schools, Primary and Secondary schools;
    - Police station;
    - Churches;
    - Government offices;
    - Agricultural technical college;
    - Multipurpose sports centre;
    - Public open space

- Filling station
- FLISP (Finance Linked Individual subsidy programme) and serviced land for the gap market.
- Reservoir

The extent of the site for the proposed development is approximately 280.7752 hectares.

1.4 Project Locality

The proposed project is located on the Remainder of Portion 3 of Elandskuil Farm No. 205 IP, Remainder of Portion 206 of Elandskuil Farm No. 206 IP and Remainder of Portion 205 of Elandskuil farm located in the JB Marks Local Municipality within the Dr Kenneth Kaunda District Municipality in the North West Province.

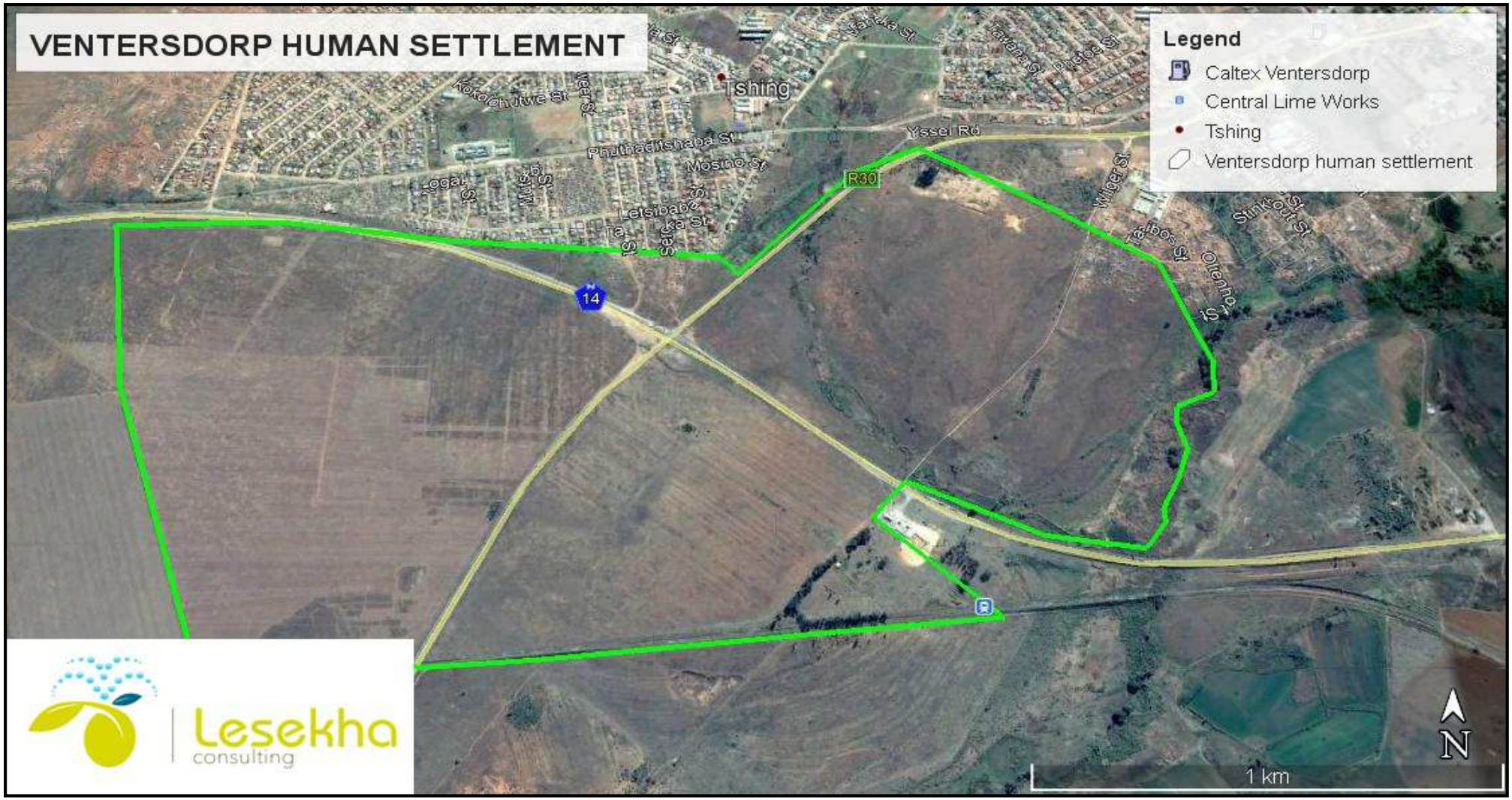


Figure 1: Locality Map

1.5 Assumptions and Limitations

This study is based on professional opinion, best practise guidelines and desktop study and therefore has intrinsic limitation regarding the level of the assessment. The study was conducted in October which is a dry season and large portion of the natural habitat was destroyed by veld fires limiting the species composition and also raised the question of the effect of frequency and timing of these fires on species composition and diversity.

The suite of wetland or riparian indicators was used at a screening or desktop level to predict or indicate the possible presence of a wetland or riparian area at a site. The study is limited in scope to spatial patterns of biodiversity and does not take into account specific processes that are affected by different components of the Integrated Human Development. The assessment was limited to direct biodiversity impact risk assessment, and was governed by the availability and accuracy of spatial data.

1.6 Background to the Grassland Ecology

Grassland defines itself: landscapes dominated by grass. Although grasses are the most visible plants, grasslands have a higher diversity than other herbaceous species, especially those with belowground storage organs such as bulbs or tubers. These plants produce many of our spectacular wild flowers and contribute to biodiversity that is second only to the Cape Fynbos in species richness. Grassland species are particularly well adapted to being defoliated, whether by grazing, fire or frost. Repeated defoliation, within reason, does no real harm to such plants nor does it reduce productivity.

African grasslands are particularly old, stable and resilient ecosystems. Most plants are perennials and surprisingly long lived, with very few annual species, which are the pioneer plants needed to repair disturbances. This renders grasslands vulnerable to destruction by cultivation; once ploughed it is invaded by weedy pioneer plants that are mostly alien. Although many grassland plants do produce seed, very little germinates, most being used as vital food for their rich rodent, insect and bird fauna. North West Province grasslands are mainly found in the highveld above 1 300 m. These are cool, dry open landscapes, with rainfall of approximately 500 mm/yr. Frost, hailstorms and lightning strikes are however common during periodic raining events. The natural occurrence of fire and other defoliating

events favour grassland plants over woody species, helping to maintain the open treeless character of grasslands. Grasslands have shallow-rooted vegetation with a growing season limited to about six months of the year. The non-growing seasons are characterised by cool and dry conditions, during which time most foliage is removed or killed by frost, and dies back to ground level. Grasslands originally covered approximately a third of North West Province, but much of this has been transformed by agriculture and other development as large parts of these grasslands occur on deep fertile soils of high agricultural value.

The unproductive winter and spring seasons in grassland require agricultural strategies for livestock and cultivation that bridge this gap in economic productivity. This substantial and irreversible reduction of the biome is due mainly to cultivation, especially industrial scale agriculture and timber growing. These land uses destroy biodiversity but extensive livestock grazing can be reasonably biodiversity-friendly, provided good management and safe stocking rates are applied.

The palatability of grass and its value as food for livestock increases with decreasing rainfall, which is also correlated with altitude, also extending from grassland into savannas. Although sweetveld grasses produce less biomass than sourveld grasses, they have higher food value and lower fibre. This means the plant nutrients are more available in lower rainfall areas due to less leaching of the soil by high rainfall. The 650 mm rainfall isoline approximately separates these two livestock zones. Fire is a characteristic feature of grassland (and savannas) and is a necessary component of good land management. Grassland plants depend on fire, they resprout annually from their rootstocks.

Without frequent fire, grasslands eventually become invaded with woody species and some herbaceous plants die. Regular burning to complement good grazing management helps to prevent the increase of species unpalatable to livestock, including woody species that result in bush encroachment. The large number of conservation important species in grasslands is a particular problem for environmental impact assessments. They are mostly small, very localised and visible for only a few weeks in the year when they flower. Most surveys will not pick them up and special skills are required to locate and identify them reliably.

The study area is located in the Grassland Biome of South Africa and within the Rocky Highveld Grassland. Literature refers to the grassland biome vegetation inhabited largely

by graminods of the family *Poaceae* with little or no woody vegetation but with deep leached and acid soils owing to relatively high precipitation level experienced in that biome. The type of vegetation found on the site of development for the Integrated Human Settlement is called the Dry Highveld Grassland endemic plants are rare unless where there are patches of quartzite sourveld. Phanerophyte exclusion of wordy plants in the typical grassland is indicative of altitude, prolonged low temperatures and frost in winter, this type of vegetation is also called the western grassland biome (Bezuidehound & Breadenkaamp, 1990).

1.6.1. Physiography of the area

The JB Marks Local Municipality falls under the grassland Biome. The relatively untransformed landscape of the area is attributed to the fact that land use is largely restricted to the game and Livestock grazing. In general the North West Province contributes significantly to the threatened taxa of South Africa (Hilton and Taylor, 1996). Threatened taxa over time are shown on the table below.

Threatened Taxa	**South Africa**		**North West**	
Years	1980	1995	1980	1995
Extinct	39	56	-	-
Endangered	104	241	7	18
Vulnerable	165	422	15	31
Rare	521	1322	118	103
Intermediate	259	378	12	34
Total	1088	2419	152	186

Table 1 Threatened taxa over time (Adapted from Hilton- Taylor 1996)

1.7 Critical Biodiversity Area

It focused on ways to conserve individual species, whole ecosystems, and other natural resources. A key strategy for CBA has been the establishment of reserves that can be managed for the benefit of the targeted conservation elements, be they endangered species, threatened vegetation communities, unique habitat types, or some other element of conservation concern.

The Biodiversity Management Area Selection (BMAS) problem is to identify which planning units (e.g., small watershed units) should be managed principally for biodiversity goals in order to protect or enhance at least a minimum amount of habitat for each element at risk (e.g., species, vegetation community, etc.)

1.7.1 Criteria of Identifying CBA

A CBA is an area that must remain in good ecological condition in order to meet biodiversity targets for ecosystem types, species of special concern or ecological processes. CBAs can meet biodiversity targets for terrestrial or aquatic features, or both. Together with protected areas, the portfolio of CBAs identified in a biodiversity plan must collectively meet biodiversity targets for representation of ecosystem types and species of special concern, and may also meet biodiversity targets for some ecological processes

1.7.2 Criteria for Identifying ESAs

An ESA is an area that must remain in at least fair ecological condition in order to: meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for representation of ecosystem types or species of special concern when it is not possible to meet them in CBAs; support ecological functioning of a protected area or CBA (e.g. protected area buffers); or a combination of these. ESAs can meet biodiversity targets for terrestrial or aquatic features, or both. All ecological processes important for the long-term persistence of ecosystems and species should be adequately included in the portfolio of protected areas, CBAs and ESAs. Sites selected to form part of ESAs could include sites in good, fair or even severely modified ecological condition, as long as the current ecological condition is compatible with fulfilling the purpose for which the ESA has been selected. The desired state/management objective for most ESAs is to

maintain them in at least fair ecological condition. For ESAs that are severely modified, the management objective is no further deterioration in the current ecological condition.

1.7.3 Land Use Planning Perspective

The difference between CBAs and ESAs in terms of where in the landscape the biodiversity impact of any land use activity action is most significant:

- In CBAs where a change in land use results in a change from the desired ecological state, the impact on biodiversity as a result of this change is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g. loss of a populations or habitat).
- In ESAs, however, a change from the desired ecological state is most significant elsewhere in the landscape through the indirect loss of biodiversity due to a breakdown, interruption or loss of an ecological process pathway. For example, removing a corridor results in a population going extinct elsewhere in the landscape due to loss of connectivity, or a new plantation locally results in a reduction in stream flow at the exit to the catchment, which affects downstream biodiversity.

Critical biodiversity area type 1 maintains in a natural or near-natural state that maximizes the retention of biodiversity pattern and ecological process:

- Ecosystems and species fully or largely intact and undisturbed.
- These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met.
- These are biodiversity features that are at, or beyond, their limits of acceptable change.

1.7.4 General Land Management

The BSP also includes general land management guidelines for CBAs and ESAs, e.g. Guidelines for managing loss of natural habitat in CBAs include:

- Further loss of natural habitat should be avoided in CBA 1, whereas loss should be minimized in CBA 2 i.e. land in these two categories should be maintained as natural vegetation cover as far as possible.
- CBA 1s and CBA 2s not formally protected should be rezoned where possible to conservation or an appropriate zoning, and where possible declared in terms of the Protected Areas Act.
- CBA 1 and CBA 2 can act as possible biodiversity offset receiving areas.
- The provincial biodiversity stewardship programme may wish to prioritise privately owned properties in CBA 1s and CBA 2s to be incorporated into the protected area network through biodiversity stewardship agreements. The provincial protected area expansion strategy to use the CBA Map in prioritizing these areas.

No	Land use zone	Associated land use activities	CBA	ESA1	ESA2
1.	Environmental conservation	Conservation management, low-intensity eco-tourism activities and sustainable consumptive activities	**Y**	**Y**	**Y**
2.	Tourism and Accommodation	Low Impact Tourism / Recreational and Accommodation. Low Impact Tourism / Recreational and Accommodation.	**R**	**Y**	**Y**
3.	Agriculture	Extensive Game Farming	**Y**	**Y**	**Y**
		Game Breeding / Intensive Game Farming	**Y**	**Y**	**Y**
		Arable Land – Dry land and Irrigated Crop Cultivation	**N**	**R**	**Y**
		Plantation Forestry: Timber Production.	**N**	**N**	**R**
		Agricultural Infrastructure - Intensive Animal Farming (e.g. feedlot, dairy,	**N**	**N**	**R**

No	Land use zone	Associated land use activities	CBA	ESA1	ESA2
		piggery, chicken battery).			
	Municipal Commonage	Local agri-economic development	**N**	**R**	**Y**
4.	Rural Residential	Low density rural housing or eco-estates.	**R**	**R**	**R**
		Traditional Areas (existing) and Rural Communal Settlement (New).	**N**	**R**	**R**
5.	Urban Residential	Low, low-medium, medium high, and high density urban residential development. (= NW = Urban & Business Development)	**N**	**N**	**N**
	Business / Urban Influence	An amalgamation of land use zones, including Institutional, Urban Influence, General Mixed Use, Low Impact Mixed Use, Suburban Mixed Use and General Business. (= NW = Urban & Business Development	**N**	**N**	**N**
	Open Space	Public or Private Open Space, including recreational areas, parks etc.	**R**	**Y**	**Y**
6.	Transport Services	Transportation service land uses e.g. airports, railway stations, petro-ports and truck stops, bus and taxi ranks and other transport depots. = NW = Linear Engineering Structures)	**R**	**R**	**R**
	Roads and Railways	Existing and planned linear infrastructure such as hardened roads and railways, including activities and	**R**	**R**	**R**

No	Land use zone	Associated land use activities	CBA	ESA1	ESA2
		buildings associated with road construction and maintenance, e.g. toll booths, construction camps and road depot sites. (Linear Engineering Structures)			
7.	Industrial				
	Low or High Impact and General Industry	Low Impact, General Industry and High Impact Industry (Urban & Business Development)	**N**	**N**	**N**
8.	Mining	Mining and Quarrying	**N**	**N**	**N**

*Table 2: A matrix of recommended land uses zones and associated activities in relation to the **CBA map categories***

Table notes: In the last three columns:

"Y" (Yes) means the land use or activity is compatible with the management objective for the CBA/ESA.

"R" (Restricted) means the land use or activity is compatible only if undertaken subject to certain restrictions.

"N" (No) means the land use or activity is not compatible, even with restrictions

The land use zone relate with the development of human settlements that are follows within CBA maps categories.

1.7.5 Land Use Zone: Open-Space

Open Space provides for:

- Appropriately situated sites that are easily accessible for recreational purposes and activities for local and designated communities (including the physically challenged, the elderly, women, and children), and are located and maintained to attract visitors and tourists.

- Parks, botanical gardens and other open spaces as well as corridor linkages between open areas for passive recreational purposes.

This land use zone corresponds to the SPLUMA scheduled land use purposes 'public purposes' or 'recreational purposes'. Although there will be some infra-structural development associated with this land use zone, it could potentially be compatible with some of the management objectives of CBAs and ESAs

1.7.6 Land Use Zone: Residential

The Residential zone includes:

- Residential housing in the urban or Traditional Communal Areas (Existing) and Rural Communal Settlements (New) context where the use of land is primarily for human habitation, and comprises a dwelling house, group housing or flats. It provides for safe and sustainable residential environments for all communities. It limits the allowable ancillary uses to those that can be accommodated within the residential fabric with minimal impact or disruption.

This land use zone corresponds to the SPLUMA scheduled land use purpose 'residential purposes', and represents urban residential housing.

Many zonation schemes distinguish between a number of categories of residential (e.g. Residential Zone 1, Residential Zone 2) based on density (e.g. low, low-medium, medium-high, and high), however, these have been grouped into a single category in this handbook as the impacts on biodiversity objectives, and the recommended land use guidelines, are the same.

Residential land uses are generally not compatible with the land management objectives of PAs, CBAs or ESAs, and should only be considered, subject to the necessary authorisations, in ONAs or areas with No Natural Habitat Remaining. Urban or Rural Settlement expansion should be managed through the delineation of an urban edge, and all residential developments including Traditional Communal Areas (Existing) and Rural Communal Settlements (New) (and their associated infrastructure) should be located within the urban edge. Urban or rural settlement sprawl should be avoided.

1.7.8 CBA Maps as Spatial For Ecological Sustainability

Protected areas, CBAs and ESAs can co-exist in a matrix of multiple land uses that range from intensive uses that irreversibly modify the landscape to less intensive or lower impact land uses. A Map provides the most spatially efficient configuration of CBAs and ESAs, minimising conflict with other land uses such as urban development, intensive agriculture, forestry and mining. The network of protected areas, CBAs and ESAs is designed to maximise connectivity of natural areas and to avoid further fragmentation of the landscape, which supports landscape-level ecological functioning as well as the ability of ecosystems and species to adapt to climate change.

A CBA Map would be developed before any irreversible loss of natural areas took place in the landscape, to proactively identify the optimally configured set of areas that should remain natural or semi-natural. Planning for other forms of development could then take those areas fully into account. In practice, CBA Maps are developed for landscapes with varying degrees of human modification, so the CBAs and ESAs identified need to be the best available ones given those constraints. It is often possible to select CBAs and ESAs in a configuration that avoids most conflict or potential conflict with activities in the landscape that are not compatible with maintaining natural or semi-natural ecological condition.

The more heavily and extensively modified the landscape, the fewer options for identifying CBAs and ESAs are likely to remain, and the more trade-offs there may be with other activities and land uses. In landscapes where there is intense development pressure, the need to identify CBAs and ESAs is particularly urgent, to ensure that these areas can be proactively considered in further development planning and implementation processes.

The amount of natural habitat that should be retained as CBAs or ESAs is determined through quantitative thresholds that are based on the characteristics of the species, ecosystems and ecological processes in the landscape for which the CBA Map is being developed. These quantitative thresholds are known as biodiversity targets, and they help to ensure that CBA Maps have a sound basis in science.

Map category	Landscape-level purpose	Broad management objective
CBA: Critical Biodiversity Areas	Together with protected areas, ensures that a viable representative sample of all ecosystem types and species can persist.	Must stay in largely natural ecological condition
ESA: Ecological Support Areas	Ensures the long-term ecological functioning of the landscape as a whole.	Must retain ecological processes, which often requires at least semi-natural ecological condition

Table 3: Conceptual framework for CBA maps

1.7.9 Ecological Supporting Area (ESA)

An ESA is an area that must retain its ecological processes in order to: meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for representation of ecosystem types or species of special concern when it is not possible to meet them in CBAs; support ecological functioning of a protected area or CBA (e.g. protected area buffers); or a combination of these. All ecological processes important for the long-term persistence of ecosystems and species should be adequately included in the portfolio of protected areas, CBAs and ESAs.

Two sets of criteria for selecting sites as ESAs are listed below:

- Sites or features that must always be selected as ESAs
- Sites or features that may be selected as ESAs

CBA Map category	Description	Desired state / management objective	Recommended SDF Category
CBA	Areas that must remain in good ecological condition in order to	Maintain in natural or near-natural	Environmental conservation OR

CBA Map category	Description	Desired state / management objective	Recommended SDF Category
	meet biodiversity targets.	ecological condition	Agriculture (extensive) OR Tourism (low impact) OR Open Space
ESA1	Areas that must remain in at least fair ecological condition in order to meet biodiversity targets, support ecological functioning, or deliver ecosystem services	Maintain in at least semi-natural ecological condition	Environmental conservation OR Agriculture (extensive) OR Tourism (low impact) OR Open Space
ESA2	Areas in which further deterioration in ecological condition must be avoided in order to meet biodiversity targets, support ecological functioning, or deliver ecosystem services.	Maintain current land use with no intensification	Agriculture (intensive)

Table 4: CBA Map Category

CBA MAP CATEGORY	LAND MANAGEMENT OBJECTIVE
Critical Biodiversity Area 1 (CBA 1)	Maintain in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process: • Ecosystems and species fully or largely intact and undisturbed. • These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern

CBA MAP CATEGORY	LAND MANAGEMENT OBJECTIVE
	targets. If the biodiversity features targeted in these areas are lost then targets will not be met. • These are biodiversity features that are at, or beyond, their limits of acceptable change
Critical Biodiversity Area 2 (CBA 2)	Maintain in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process: • Ecosystems and species fully or largely intact and undisturbed. • These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met. • These are biodiversity features that are at, or beyond, their limits of acceptable change
Ecological Support Area 1 (ESA 1)	Maintain in at least a semi-natural state as ecologically functional landscapes that retain basic natural attributes: • Ecosystem still in a natural, near-natural state or semi-natural state, and has not been previously developed. • Ecosystems moderately to significantly disturbed but still able to maintain basic functionality. • Individual species or other biodiversity indicators may be severely disturbed or reduced. • These are areas with low irreplaceability with respect to biodiversity pattern targets only
Ecological Support Area 2 (ESA 2)	Maintain as much ecological functionality as possible (generally these areas have been substantially modified): • Maintain current land use or restore area to a natural state.

CBA MAP CATEGORY	LAND MANAGEMENT OBJECTIVE
	• Ecosystem NOT in a natural or near-natural state, and has been previously developed (e.g. ploughed). • Ecosystems significantly disturbed but still able to maintain some ecological functionality. • Individual species or other biodiversity indicators are severely disturbed or reduced and these are areas that have low irreplaceability with respect to biodiversity pattern targets only. • These are areas with low irreplaceability with respect to biodiversity pattern targets only. These areas are required to maintain ecological processes especially landscape connectivity.

Table 5: A framework for linking the spatial planning categories (CBA Map categories) to land use planning and decision making guidelines based on a set of high-level land management objectives

2 Legislative Requirements

The following section briefly examines the legislation that is relevant to the scope of the assessment**.**

Section 52 of the Biodiversity Act provides for the listing of Threatened or Protected Ecosystems. Threatened Ecosystems can be listed as Critically Endangered, Endangered or Vulnerable. In addition to listed ecosystems, there are several other ecosystems that warrant special conservation attention. These include:

- Ecosystems listed as Critical Biodiversity Areas (CBAs or Ecological Support Areas in bioregional or biodiversity sector plans. Critical Biodiversity Areas (CBAs) represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. When incorporated into municipal Spatial Development

Frameworks and bioregional plans, such fine-scale plans are recognized under the National Environment Management Act (NEMA) and various activities listed under the Act pertain.

- Ecosystems listed as Freshwater Ecosystem Priority areas in the National Freshwater Ecosystem Priority Areas Project (NFEPAP).
- Ecosystems listed as high water yield areas or groundwater recharge areas, as listed by NFEPA
- Ecosystems that play an important role in the provision of ecosystem services
- Ecosystems that are important in playing a role in ecosystem based adaptation

A summary of some of the relevant section of the Acts which govern the activities and potential impacts to biodiversity associated with development or economic activities are listed below:

2.1 Constitution of South Africa, Act No. 108 of 1996

Whereby everyone has the right to have the environment protected and conserved for the benefit of present and future generations. South Africa has rigorous and comprehensive environmental legislation aimed at preventing degradation of the environment, including damage to wetland systems. Development proposals within or near any wetland system are subject to thorough bio-physical and socio-economic assessment as mandatory processes of related legislation. These processes are required to prevent degradation of the environment and to ensure sustainable and environmentally conscientious development.

2.2. The National Environmental Management Act, No. 107 of 1998 (NEMA)

NEMA requires that measures are taken that "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In addition:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied:
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and

- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, *especially where they are subject to significant human resource usage and development pressure*.

2.3 National Environmental Management: Biodiversity Act (NEMBA) (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. NEMBA also deals with endangered, threatened and otherwise controlled species, under the TOPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

2.4 National Forests Act (No. 84 of 1998)

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated"*.

2.5 Conservation of Agricultural Resources Act (Act 43 of 1983)

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

2.6 The National Water Act, Act 36 of 1998 (NWA)

It is important to note that water resources, including wetlands are protected under the National Water Act (Act No. 36 of 1998) (NWA). Protection‟ of a water resource, as defined in the Act entails:

- "Maintenance of the quality of the water resource to the extent that the water resource may be used in an ecologically sustainable way; prevention of the degradation of the water resource; and the rehabilitation of the water resource;"

  The inclusion of physical properties of a water resource within the definition of pollution entails that any physical alterations to a water body, for example the excavation of a wetland or changes to the morphology of a water body can be considered to be pollution. Activities which cause alteration of the biological

properties of a watercourse, i.e., the fauna and flora contained within that watercourse are also considered pollution.

In terms of Section 19 of the Act owners / managers / people occupying land on which any activity or process undertaken that causes, or is likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include measures to, inter alia:

- "cease, modify, or control any act or process causing the pollution;
- comply with any prescribed waste standard or management practice;
- contain or prevent the movement of pollutants;
- remedy the effects of the pollution; and
- Remedy the effects of any disturbance to the bed and banks of a watercourse**."**

2.7 The National Water Act and Riparian Areas

Riparian habitat is afforded protection under the National Water Act in a number of ways. Firstly reference in the National Water Act to a watercourse includes its banks, on which riparian habitat is encountered. Riparian areas are thus afforded the same degree of protection as the river beds and channels alongside which they occur. Riparian habitat is also important in the context of resource quality objectives that are a critical part of the Act. In terms of Section 13(1) of the Act resource quality objectives must be determined for every significant water resource, and are a central part of data type specifications relating to national monitoring systems and national information systems as determined in Section 137(2) and Section 139(2) of the Act respectively. Resource quality is important in the context of riparian habitat as resource quality as defined in the Act means the quality of all aspects of a water resource and includes the character and condition of the riparian habitat. In terms of Section 26(4) of the Act, the need for the conservation and protection of riparian habitat must be taken into account in the determination and promulgation of regulations under the Act.

2.8 The National Heritage Resources Act, No. 25 of 1999 (NHRA)

In terms of Section 38 of the NHRA; any person who intends to undertake a development as categorised in the NHRA must at the very earliest stages of initiating the development notify the responsible heritage resources authority, namely the South African Heritage Resources Agency (SAHRA) or the relevant provincial heritage agency. These agencies would in turn indicate whether or not a full Heritage Impact Assessment (HIA) would need to be undertaken. Should a permit be required for the damaging or removal of specific heritage resources, a separate application will be submitted to SAHRA or the relevant provincial heritage agency for the approval of such an activity.

2.9 Environment Conservation Act

The Environmental Conservation Act (Act 73 of 1989) provides for the effective protection and controlled utilization of the environment. This Act has been largely repealed by NEMA, but certain provisions remain, in particular provisions relating to environmental impact assessments. The ECA requires that developers must undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the ESIA regulations.

2.10 Protected Areas Act

The protected Areas Act (act no 57 of 2003) provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.

2.11 Convention of Biological Diversity

The Convention of Biological Diversity is an international legally binding treaty with three main goals; conserve biological diversity (or biodiversity); ensure sustainable use of its components and the fair and equitable sharing of benefits arising from genetic resources.

2.12 Convention on International Trade in Endangered Species

CITES is an international agreement between governments, drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). The aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival and it accords varying degrees of protection to more than 33,000 species of animals and plants.

2.13 Protected sites in terms of the National Heritage Resources Act, Act No. 25 of 1999

The National Heritage Resources Act provides for an integrated and interactive system for the management of the National Heritage Resources and empowers civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations. Furthermore, the act establishment the South African Heritage Resources Agency (SAHRA) in 1999. SAHRA is tasked with protecting heritage resources of national significance.

2.14 Description of Compliance with the Relevant Legislation

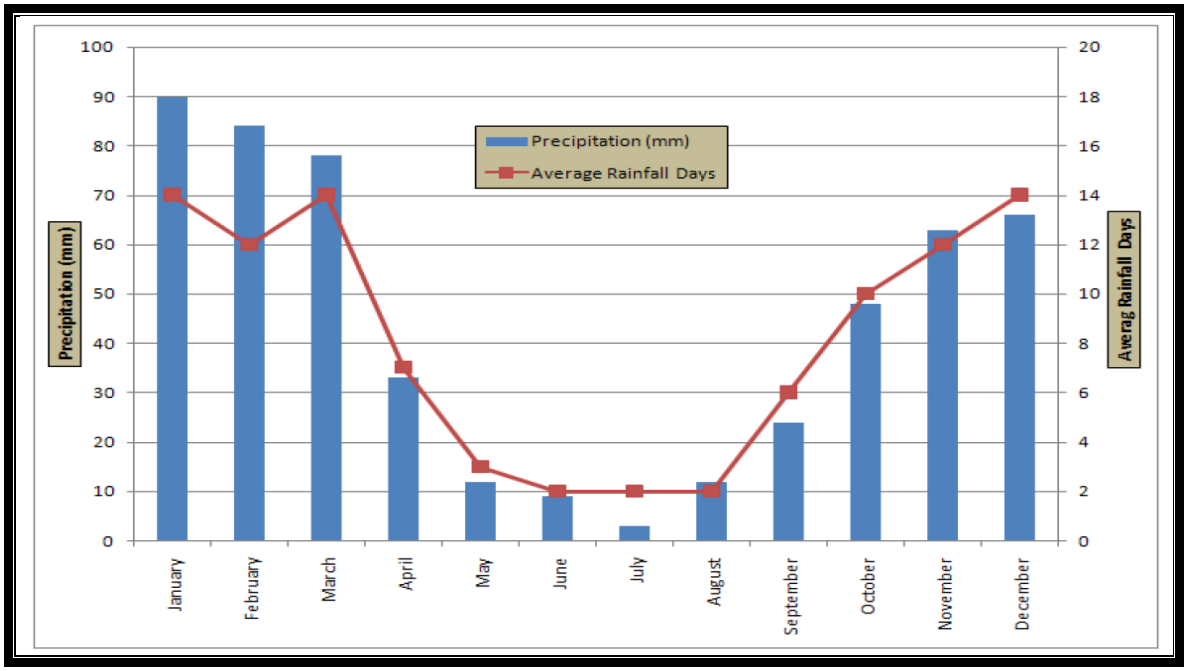
APPLICABLE LEGISLATION	GOVERNING AUTHORITY	SIGNIFICANCE THE LEGISLATION TO THE TO THE APPLICATION
World Heritage Act No 49 of 1999	Department of Environmental Affairs	The Act recognizes the need to safeguard the integrity of World Heritage Sites; the need for integrated management plans over World Heritage Sites; land matters in relation to World Heritage Sites.
The National Environmental Management Biodiversity Act no 10 of 2004	Department of Environmental Affairs	The Act provides for the protection of species and ecosystems that warrant national protection. Wetlands are important ecosystems and they house important species as a result they must be protected.
The National Environmental Management	Department of Environmental Affairs	The Act provides for the protection and conservation of ecologically viable and natural landscapes and the management of

APPLICABLE LEGISLATION	GOVERNING AUTHORITY	SIGNIFICANCE THE LEGISLATION TO THE TO THE APPLICATION
:Protected Areas Act No 57 of 2003		those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas.
The National Water Act, Act 36 of 1998 (NWA)	Department of Water and Sanitation	The Act provides for the protection and conservation of water resources including wetlands maintenance of the quality of the water resource to the extent that the water resource may be used in an ecologically sustainable way; prevention of the degradation of the water resource; and the rehabilitation of the water resource.

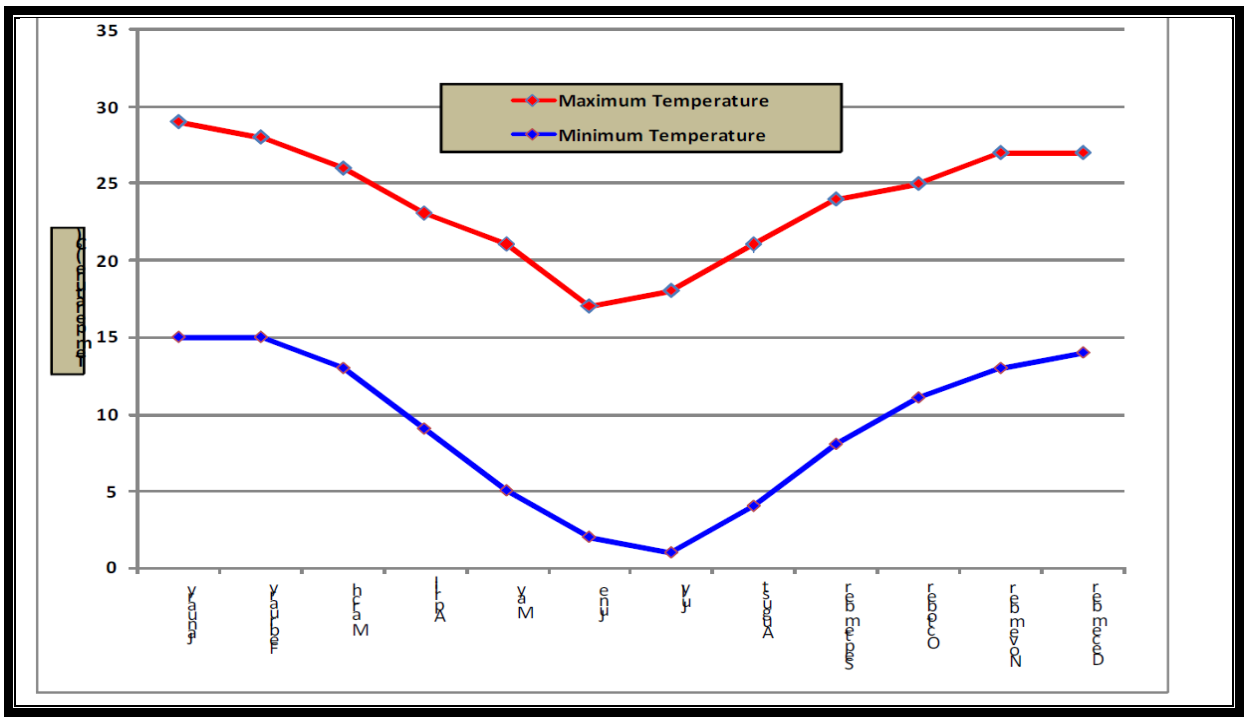
3. Biophysical Environment

3.1 Climate

Ventersdorp normally receive an average of 522 mm of rain per year between 2000 and 2012, with most rainfall occurring mainly during midsummer. Graph 1 indicates the average rainfall values for Ventersdorp per month. It receives the lowest rainfall (3 mm) in July and the highest (90 mm) in January. The monthly distribution of average daily maximum temperatures (Graph 2) indicates the average midday temperatures for Ventersdorp range from 17°C in June to 29°C in January. The region is the coldest during June when the mercury drops to 1°C on average during the night.



Graph1: Rainfall data (average) for Ventersdorp, North West Province (200-2012)



Graph 2: Temperature data (averages) for Ventersdorp, North West Province (200-2012)

3.2 Vegetation of the site

The study area is located in the Grassland Biome of South Africa and within the Rocky Highveld Grassland and Dry Sandy Highveld Grassland. Species within grasslands are non-grassy herbs (forbs), most of which are perennial plants with large underground storage structures. Frost, fire and grazing maintain the herbaceous grass and forb layer, and ultimately prevent the establishment of tall woody plants (Tainton, 1999). According to the latest vegetation mapping in the country, the specific vegetation type is classified as (Mucina & Rutherford, 2006.

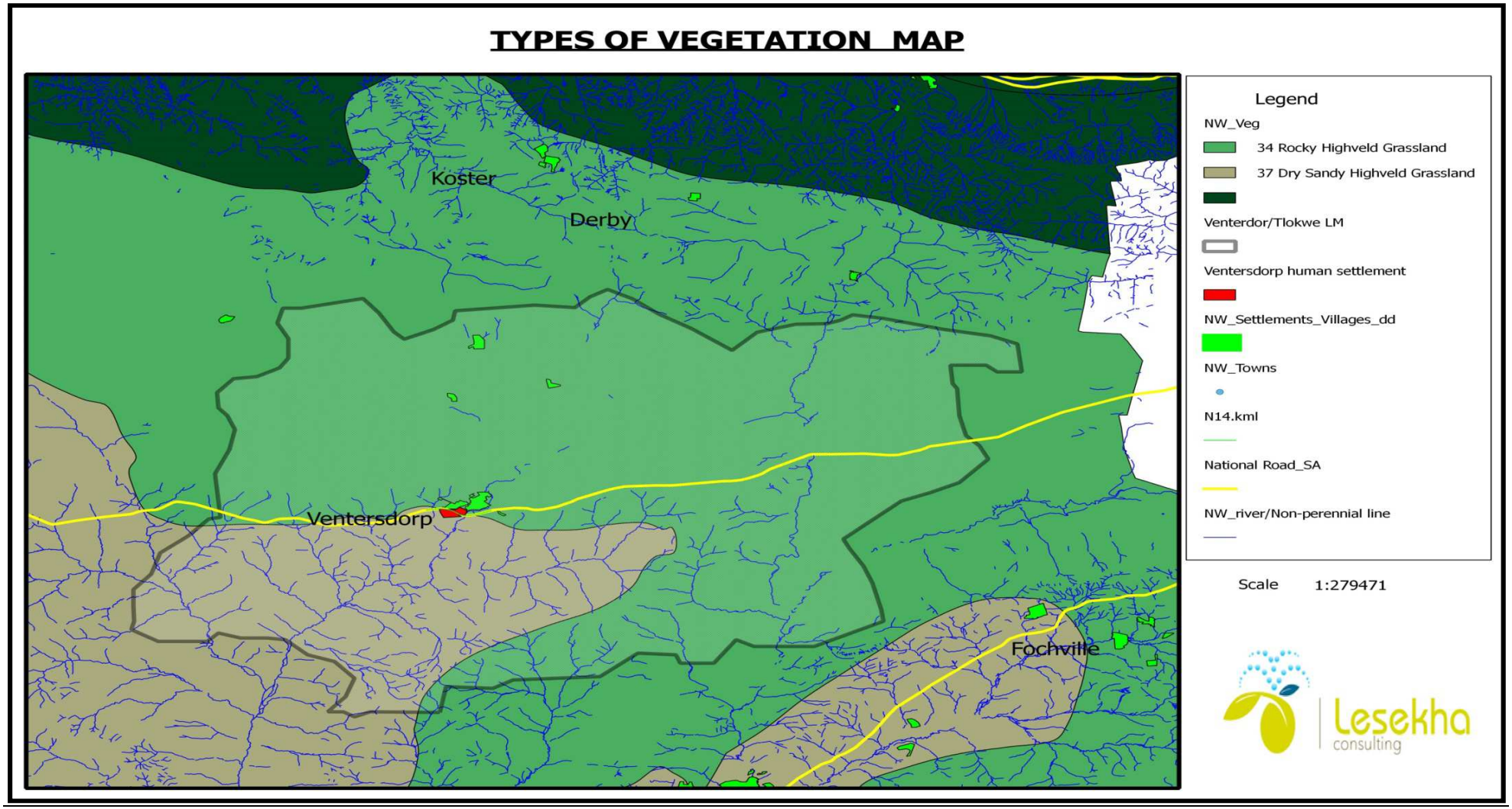


Figure 2: Vegetation of Ventersdorp

3.3 Regional land cover & land use

Land use often determines land cover; it is an important factor contributing to the condition of the land. Different uses have varying effects on the integrity of the land. For the purpose of this assessment, land cover are loosely categorized into classes that represent natural habitat and land cover categories that originated from habitat degradation and transformation on a local or regional scale. Areas that are characterized by high levels of transformation and habitat degradation are generally more suitable for development purposes as it is unlikely that biodiversity attributes of conservation importance will be present or affected by development. Conversely, areas that are characterized by extensive untransformed and pristine habitat are generally not regarded suitable options for development purposes.

The character of the general region is typified by significant recent developments. The result is nodal type developments dispersing from a central area. Historically the larger region was characterized by natural woodland and Savanna habitat with extremely limited transformation levels. Extremely little arable agriculture is practiced, mainly because of relative low rainfall and poor soils that predominate in the region. Recent mining developments and associated infrastructure developments such as power stations, a more defined and intricate road infrastructure, housing, residential developments resulted in large-scale transformation of natural habitat of the region. JB Marks Local Municipality is situated within the Kenneth Kaunda District Municipality and comprises 376 405 ha, of which 246 385 ha is currently untransformed (65.5 % of the municipality) (BGIS, 2007). A brief appraisal of available ENPAT data indicates that the major anthropogenic transformation activity in the immediate region of the study site is commercial agriculture. Remaining areas within the surrounds comprises of grasslands where intensive grazing cattle grazing is practiced.

3.4 Topography, Relief & Slopes

The general topography of the area is flat to gently undulating plains with short, dry grassland, with some woody species occurring in bush clumps. Topographical heterogeneity is recognized as a powerful influence contributing to the high biodiversity of southern Africa. Landscapes composed of spatially heterogeneous abiotic conditions

provide a greater diversity of potential niches for plants and animals than do homogeneous landscapes. The species richness and biodiversity has been found to be significantly higher in areas of geomorphological heterogeneity. Ridges and rocky outcrops are characterized by high spatial variability due to the range of differing aspects, slopes and altitudes all resulting in differing soil (*e.g.* depth, moisture, temperature, drainage, nutrient content), light and hydrological conditions. Temperature and humidity regimes of microsites vary on both a seasonal and daily basis. Moist cool aspects are more conducive to leaching of nutrients than warmer drier slopes. Variation in aspect, soil drainage and elevation/altitude has been found to be especially important predictors of biodiversity.

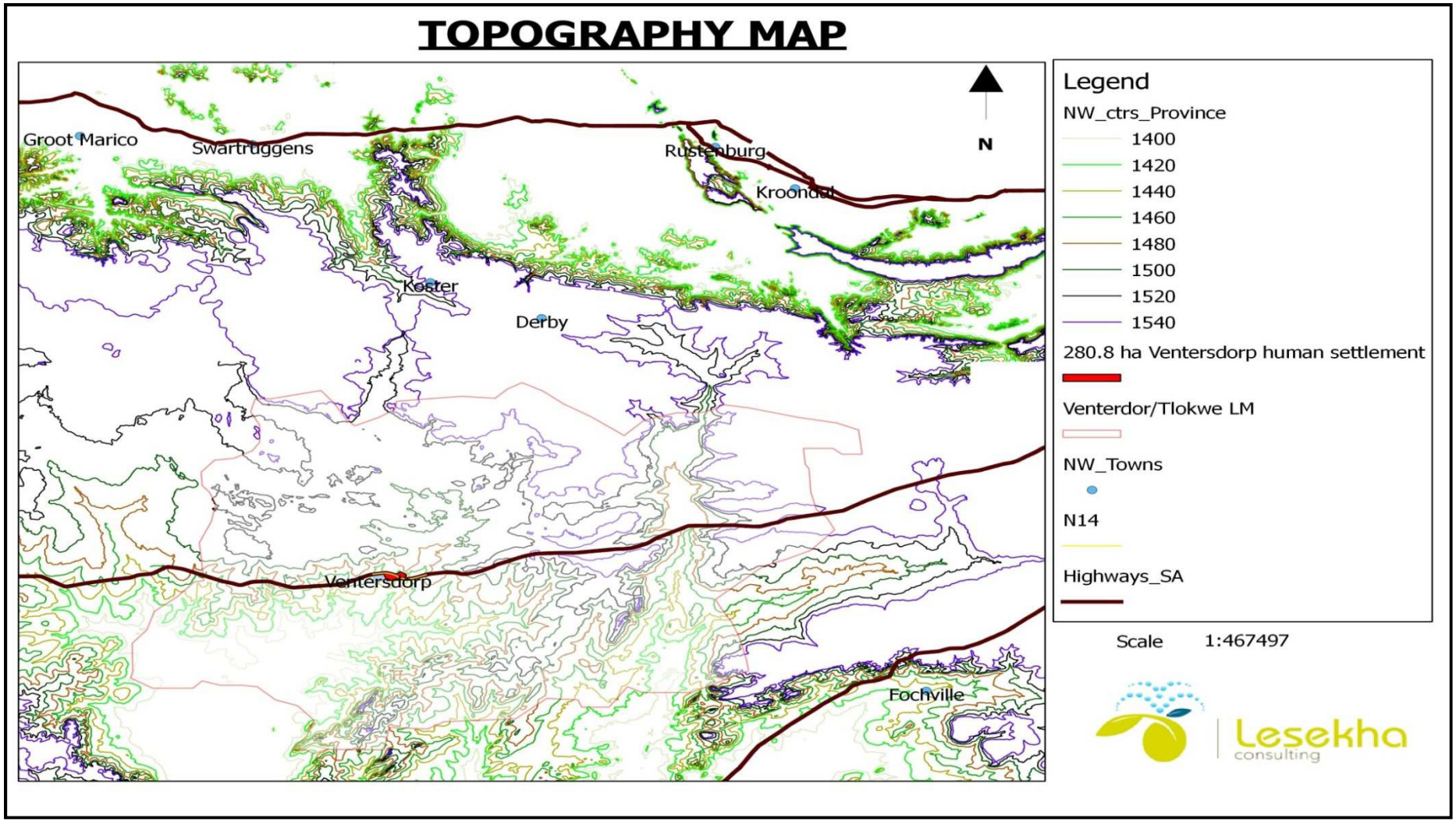


Figure 3: Topography of the area

3.5 Regional Geology

Basaltic lavas of the Klipriviersberg Group and andesitic lavas of the Allanridge Formation (both Ventersdorp Supergroup) covered by aeolian sand (western part of the area) or calcrete, with the eutrophic plinthic soils, which are mainly yellow apedals (Avalon and Pinedene) and rarely red apedals (Hutton) or Clovelly in bottomlands. The Chuniespoort Group (situated within the Transvaal Basin of the Transvaal Supergroup), and specifically the Neoarchaean (~2600-2500 million years old [Ma]) dolomites of the Malmani Subgroup, dominates the region.

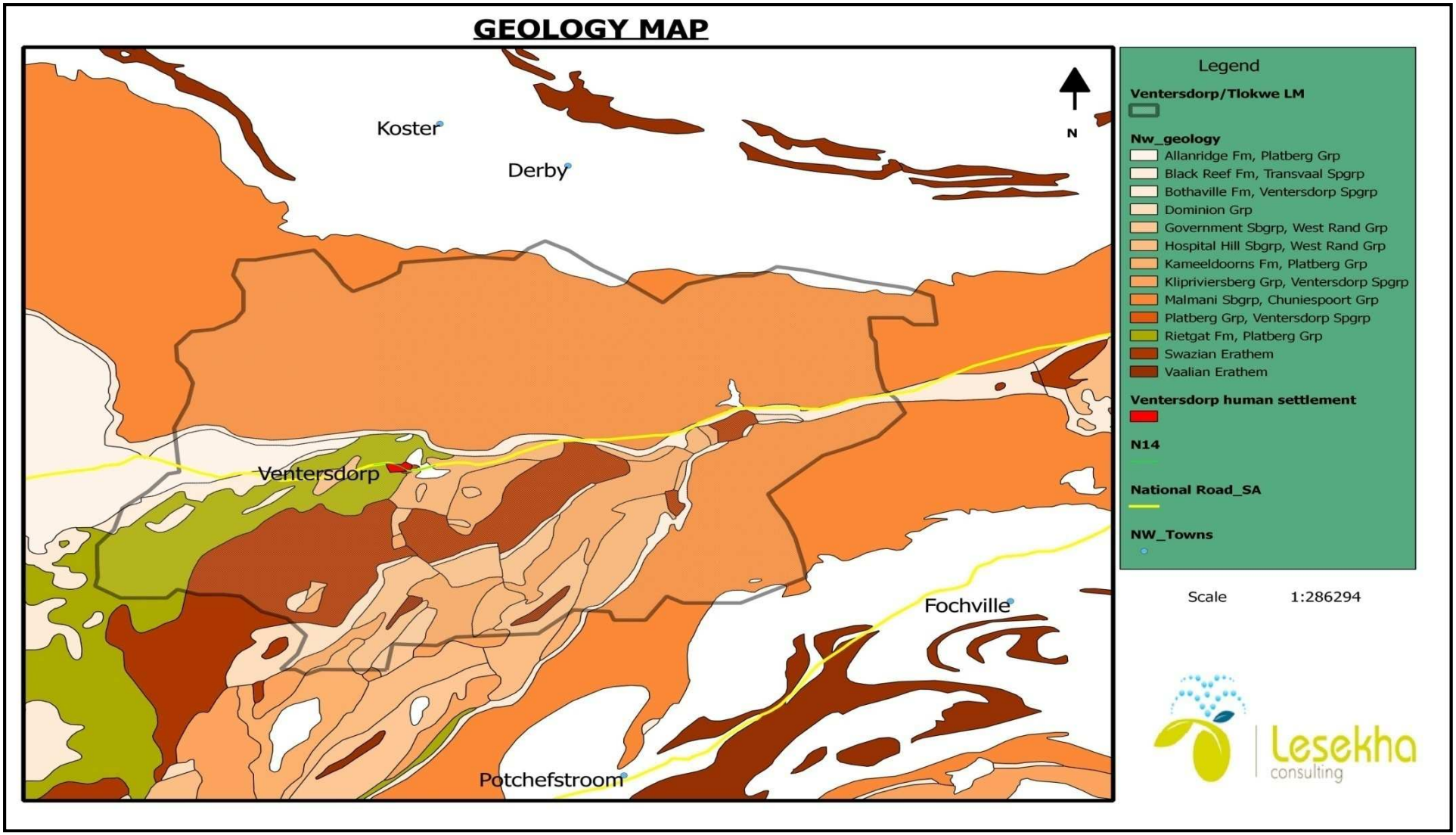


Figure 4: Geology map for Ventersdorp

3.6 Wetlands and Hydrology

The project site is located in the east of the secondary catchment C2 more specifically within the C24E quaternary catchment drained by the Skoonspruit River which will eventual drain in the Vaal River. The project is located in the Skoonspruit River system. The surface water attributes of the C24E quaternary catchment are summarised in (Hydrological Report). This includes the Mean Annual Precipitation (MAP), Mean Annual Runoff (MAR), and Mean Annual Evaporation (MAE) as obtained from the Water Resources of South Africa 2012 Study (WR2012). (Hydrological Report) presents the regional hydrology.

In the Vaal Catchment, land use is predominately mining, dry-land and limited irrigated agriculture and urbanization. The Skoonspruit dolomitic eye represents an important resource in the upper part of the catchment, providing water for irrigation agriculture and Ventersdorp as well as base flow in the river.

3.7 Surface water

Water, salt and processes linked to concentration of both are the major controls of the creation, maintenance and development of peculiar habitats. Habitats formed in and around flowing and stagnant freshwater bodies, experiences waterlogging (seasonal or permanent) and flooding (regular, irregular or catastrophic), leading to formation of special soil forms. Invariably, both waterlogged and salt-laden habitats appear as special', deviate strongly from the typical surrounding zonal vegetation. They are considered to be of azonal character (Mucina & Rutherford, 2006).

Water, in conjunction with geology, soil, topography and climate, is responsible for the creation of remarkably many types of habitats. Water chemistry, temperature and temporary changes in both, together with the amount of water (depth of water column), timing of occurrence (regular tides or irregular floods) and speed of its movement (discharge, flow and stagnation) are the major factors shaping the ecology of biotic communities occupying such habitats (Mucina & Rutherford, 2006).

Areas of surface water contribute significantly towards the local and regional biodiversity due to atypical habitat that is present within ecotonal areas. Ecotones (areas or zones of transition between different habitat types) are occupied by species occurring in both the

bordering habitats, and are generally rich in species due to the confluence of habitats. However, considering the high species richness, these areas are extremely important on a local and regional scale.

3.8 Ecological Characteristics

According to the Critical Biodiversity Area features description the ecosystem is described as CBA 1 and further states that the remaining patches form part of provincially endangered (E) ecosystems (vegetation types).

3.9 Floristic Environment

According to Mucina and Rutherford (2006) the conservation status is regarded as Endangered, implying an ecosystem that has undergone significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems. The limited diverse shrub or tree component reflects the grassland physiognomy. The locally dominant shrub layer indicates a moderate deteriorated state of the grassland because of inappropriate grazing regimes.

3.10 Faunal Environment

This faunal assessment is based on a desktop appraisal of available information gleamed from various sources, as well as basic observations made during a brief site investigation. No detailed or long-term surveys were conducted for the assessment and results should be interpreted with caution. In particular, the account of animals observed on the site, immediate surrounds is not regarded comprehensive, and it is highly likely that a higher diversity of animals will inhabit the site and, particularly, natural habitat of the immediate surrounds.

4. Regional Conservation Planning

The North West Province Biodiversity Conservation Assessment (Version 1.2) (Desmet, et. al., 2009) (NWPBCA) provides for a strategic categorisation of biodiversity attributes of the province, based on a conservation assessment of the North West Province. This assessment is used to inform the development of the Provincial Biodiversity Sector plans,

bioregional plans, and also be used to inform Spatial Development Frameworks (SDFs), Environmental Management Frameworks (EMFs), and Strategic Environmental Assessments (SEAs) and in the Environmental Impact Assessment (EIA) process in the province. This report also forms the basis, through mapping of critical biodiversity areas (CBAs), for the development of a biodiversity sector plan document in line with SANBI's guidelines on the development of bioregional plans. CBA's are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI 2007).

These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision making tools. Ecological support areas (ESA's) represent landscape sections that are not essential for meeting biodiversity representation targets/thresholds, but which play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

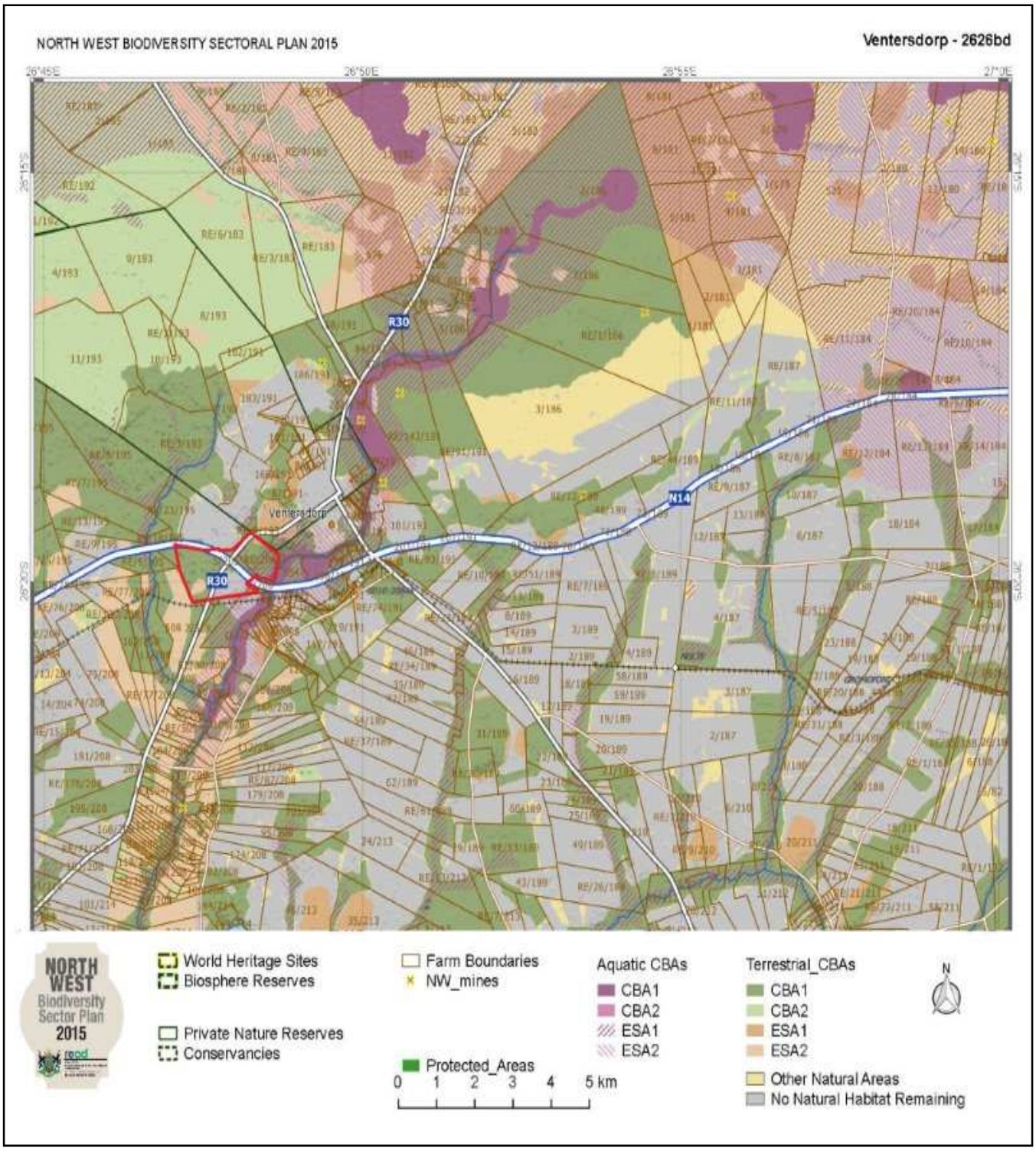


Figure 5: CBA Map

5. Methodology

5.1 Site Visit

A site visit was undertaken on the 6th, 7th and 13th and 14th of October 2017 to sample the species (fauna and flora) that are found on this site. The method contained within the DWAF guidelines for wetland delineation was followed and the four wetland indicators, as well as general hydrology of the site were examined. Prior to the site visit, the desk top study was conducted to determine if there are any known protected wetland areas are present. The field survey was done to check if any wetted areas are present onsite, and to determine the presence of hydric soils, i.e., wetland habitat, in the vicinity of the proposed Integrated Human Settlement Development.

During the survey, a walk-about was conducted to investigate the current status of the areas photographs of important features were taken and will be included in the report. Typically the presence of wetlands is determined through wetland delineation. The accepted procedure for wetland delineation in South Africa is based upon the DWA (F) guidelines A practical field procedure for the identification and delineation of wetlands and riparian areas" (DWAF, 2005), which stipulates that consideration be given to four specific wetland indicators to determine the boundary of a wetland. The vegetation assessment was also consulted to provide information on plant species present within the footprint of the proposed development site.

5.2 Vegetation and Animal Survey

5.2.1 Desktop Study

A desktop study was conducted to determine which fauna and flora species could possibly occur on the site under natural conditions. This was conducted by reviewing the available literature on the vegetation types of South Africa. The information gathered during this phase was used to identify aspects of the current natural environment that should receive more attention. A brief description of the natural vegetation type of the area, according to the descriptions in Low & Rebelo (1996) and Acocks (1988) is given. All plants that have

Red Data and Endemic status according to Hilton-Taylor (1996) were also investigated. According to distribution maps obtained from Skinner & Chimimba (2005) and Friedman & Daly (2004) a list of mammals that could be found in this study area was created. Roberts (2003) and Barnes (2000) were used to identify bird species that may occur in and around the proposed project site as well as their Red Data status. Branch (2001), Passmore & Carruthers (1995), and Henning & Henning (1989), were all used to ascertain the distribution of reptiles and amphibians.

The invertebrate literature survey involved consulting the IUCN Red Data and CITES sites for listed animals that occur in South Africa. Unfortunately these internet sites do not always offer detailed distribution maps. Coupled with lack of information on many species (Data Deficient category), it is difficult to conclude, for certain, if these organisms occur in the particular region of South Africa relevant to this project

5.3 Tools - The Measurement of Biodiversity Patterns

South Africa has pioneered some of the best biodiversity science in the world and is at the forefront of developing spatial and non-spatial information and tools for the management and conservation of biodiversity. These biodiversity information and tools assist in identifying and addressing impacts on biodiversity at the level of ecosystems and habitats. While management and conservation of biodiversity is often associated with formal reserves or protected areas, which are a key component of biodiversity management, *the majority of important remaining biodiversity is found outside protected areas, on private or communal land in production landscapes and seascapes.*

In order to assess the impact of the integrated human settlement development on biodiversity, one needs to understand the various ways that commercial activities could impact biodiversity. Impacts on biodiversity and ecological services occur in the following broad categories:

Direct impacts - directly linked to the development/activity (e.g. clearing of land, extraction of water, contamination of water bodies, sedimentation, etc.).

Indirect impacts - resulting from the development/activity, may occur beyond or downstream of the boundaries of the development site and/or after activity has ceased (e.g. migration of pollutants from waste sites, reduced flow in downstream rivers,).

Induced impacts - not directly attributable to the development/activity, but are anticipated to occur because of the presence of the development (e.g. impacts of associated industries, establishment of residential settlements with increased pressure on biodiversity).

Cumulative impacts - impacts from the development/activity combined with the impacts from past, existing and reasonably foreseeable future developments/activities that would affect the same biodiversity or natural resources (e.g. several factories in the same catchment collectively affected water quality or flow). Impacts may endure in the short term (e.g. during construction only), or may last for far longer, even decades or centuries, and may effectively be irreversible.

This study was limited to the assessment of direct impacts.

6 Approach used in this study

6.1 Use existing spatial biodiversity data to inform the analysis.

South Africa has sophisticated information available on the biodiversity of the country and the associated services on which lives and livelihoods depend (e.g. healthy water resources). Based on the principles of systematic biodiversity planning, this information has been used to identify *biodiversity priority areas (or critical biodiversity areas), which are features in the landscape or seascape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services.* These district-wide biodiversity assessments are commissioned to inform Spatial Development Frameworks (SDFs), Biodiversity Sector plans, Environmental

Management Frameworks (EMFs), Strategic Environmental Assessments (SEAs) and the Environmental Impact Assessment (EIA) process. The Biodiversity Assessments identify Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state.

The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives.

The loss or degradation of biodiversity and ecosystem services in these biodiversity priority areas would be difficult - or in some cases impossible - to compensate or offset; there are no cost-effective substitutes for many of the services they deliver. The degradation or loss of these services could have significant implications for people and economic activities downstream of these ecosystem service flows. Biodiversity priority areas should therefore inform and influence spatial land use policies and plans, including policies and plans for sustainable development. This data was obtained from the BGIS website, a repository of biodiversity and ecosystem data on the South African National Biodiversity Institute website: www.bgis.sanbi.org. The SANBI database collates the most up-to-date biodiversity data available, and is restricted to the borders of South Africa.

Biodiversity data that were considered (where relevant or available):

- Species - fauna and flora species, and species of special concern
- Vegetation types
- Ecosystems, including threatened ecosystems
- Wetlands and freshwater areas
- Critical biodiversity areas and ecological support areas, which play an important function in supporting biodiversity
- Current Protected Areas, including Marine Protected Areas and proposed expansion of Protected Areas
- Regional and local maps of the above spatial data within proximity to the development site.

Biodiversity mapping has been used as the primary method to identify the areas of most risk/impact from the development site.

- This data analysis was represented graphically in a Geographical Information System (GIS) database and outputted as maps at a regional and local scale. A desktop study was conducted to assess the presence and distribution of ecologically sensitive, species and habitats within close proximity of the developmental site.

- A broad sensitivity rating was assigned to integrated Human Settlement Developmental site. The impact rating is based on an expert analysis of the likelihood of impacts relevant to the type of biodiversity in the vicinity of the site.

7 RESULTS

7.1 Results for Flora and Fauna Field Survey

The field survey was conducted in a dry season and immense degradation of the site has occurred because of uncontrolled veld fires, illegal dumping and overflowing sewage, therefore no ecological significant species where identified. According to previous studies done on the site possible Red data species that can be found on site include *Gunnera perpensa, Eucomis autumnalis* and *crinum macowanji*. The recorded species diversity on the report is regarded representative of the regional ecological types that could be represented in the study area. Some and plant species. Also refer to table 7 for the identified grass onsite. (***Refer to the attached list as attached on Appendix 1)***

Picture 1: Crinum macowanii

Picture 2: Eucomis automnalis

Picture 3: Geophyte Crinum Bulbispermum

7.2 Results on Red Data Plant Species

South Africa's Red List system is based on the IUCN Red List Categories and Criteria Version 3.1 (finalized in 2001), amended to include additional categories to indicate species that are of local conservation is concern. The IUCN Red List system is designed to detect risk of extinction. Species that are at risk of extinction, also known as threatened or endangered species are those that are classified in the categories Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

The SANBI info base for the 2626BD ¼- degree grid indicate the known presence of only one (1) species of conservation concern within the immediate region, namely *Cleome conrathii* (Near threatened). Similar to the regional phytodiversity, this low number reflects the paucity of floristic knowledge, rather than the true absence of plant taxa of conservation concern from the area. It is highly likely that, with a more detailed assessment of the region, numerous plants of conservation concern will be recorded. However during the site inspection no Red data species were recorded on the site. (Refer to the attached list on Appendix 1).

7.3 Results on Plant communities

The plant communities described in this section occur within the boundaries of the site of differentiating landscape features. These landscape features include altitude, degree of slope, rockiness, presence of moisture and soil type, and all affect the number and type of vegetation present. The vegetation types that were found on site are shown below.

Scientific name	Common name	Densities	Rare/common	Declining / increasing
Triraphis androgonoides	Broom needle grass	medium	common	stable
Eragrostis rigidor	Curly leave	high	common	increasing
Brachaia negropedata	Black footed grass	Low	Rare	Declining

Scientific name	Common name	Densities	Rare/common	Declining / increasing
Aristida junciformis	Gongoni three awn	Medium	common	increasing
Sporobus Africans	Ratstail dropseed	Low	Rare	declining
Sporobus fimbriatus	Dropseed grass	Low	Common	Declining
Eragrastis gummiflua	Gum grass	Low	Rare	Stable
Eragrostis superba	Saw tooth love grass	Low	Rare	Declining
Protis patens	Cat tail	Low	Rare	Declining
Aristid congetsa	Three awn	Medium	Common	Increasing
Hyparrhenia hitra	Common thatching grass	High	Common	Increasing
Melinis nerviglummis	Bristle leaved red top	Low	Common	Stable
Anthephora pubescens	Wool grass	Low	Common	Declining
Setria sphacelata	Bristle grass	Medium	Rare	Declining
Finger huthia Africana	Thimble grass	Low	Rare	Stable
Elonurus muticus	Wire grass	Medium	Common	stable
Themeda triada	Red grass	Medium	Common	Stable
Andropogon eucomus	Snowflake grass	Medium	Common	Stable
Microchloa caffra	Pincushion grass	Low	Rare	Declining
Trachypogon spicatus	Giant spear grass	Low	Common	Increasing

Scientific name	Common name	Densities	Rare/common	Declining / increasing
Enneapogon scoparious	Bottle brush grass	Low	Common	Stable

Table 7: Identified grass

Scientific name	Common name	Densities	Rare/common	Declining / increasing
Rhus chirindensis	Red currant rhus	Medium	Common	Stable
Acacia ataxacantha	Flome thorn tree	Medium	Common	Stable
Acacia farnesiana	Sweet Acacia	Medium	Common	Stable

Table 8 .Identified trees

7.4 Results Mammals

Mammals observed and recorded in the area Actual sightings, spoor, calls, dung and nesting sites were used to establish the presence of animals on the proposed project site. The evidence of dung and spoor suggests that animals were present in the area although very few were recorded during the surveys. Table lists all mammals observed by both specialists and resident farmers.

Scientific name	Common name	Densities	Rare/common	Declining increasing
Rhabdomys pumilo	Stripped field mouse	Medium	Common	Declining
Pedetes capensis	Spring hare	Median	Common	Stable
Hystrix africaeustralis	Porcupine	Low	Rare	Declining

Table 9: Identified mammals

8 Wetland Delineation

A site assessment conducted on the 20th of November 2017 was aimed at delineating the watercourses located at Ventersdorp (on the Remaining extent of the farm Elandskuil 202-IP and on the Remaining Extent of the farm Elandskuil 206 IP). The propose development site traverse the following watercourse (Figure 6):

- Channeled valley bottom wetland 1: S26° 19' 42.12" E26° 48' 6.82"
- Channeled valley bottom wetland 2: S26° 19' 50.91" E26° 48' 44.20"
- Seep 1: S26° 19' 43.81" E26° 48' 34.64"
- Seep 2: S26° 20' 11.63" E26° 47' 43.46"

The watercourse, especially the channelled valley bottom wetlands, was transformed significantly from its theoretical benchmark condition, although the particular wetlands still represent typical wetland characteristics. The increased hardened surfaces in the local catchment of the wetland and associated storm water together with extensive continues input of sewage due to leaking pipes and dysfunctional treat plants resulted in increased flow-peaks and associated canalisation in the wetland areas. The hydrology of the wetlands was altered over the years and erosion is evident.

A scientifically calculated buffer of 33m is considered appropriate for this site. The delineated wetlands, together with the buffer zones should be considered as a sensitive area and excluded from the development footprint. It is further important to take the position of the watercourse within landscape (Figure 7) into consideration when planning development as this is the area where water will flow and accumulate.

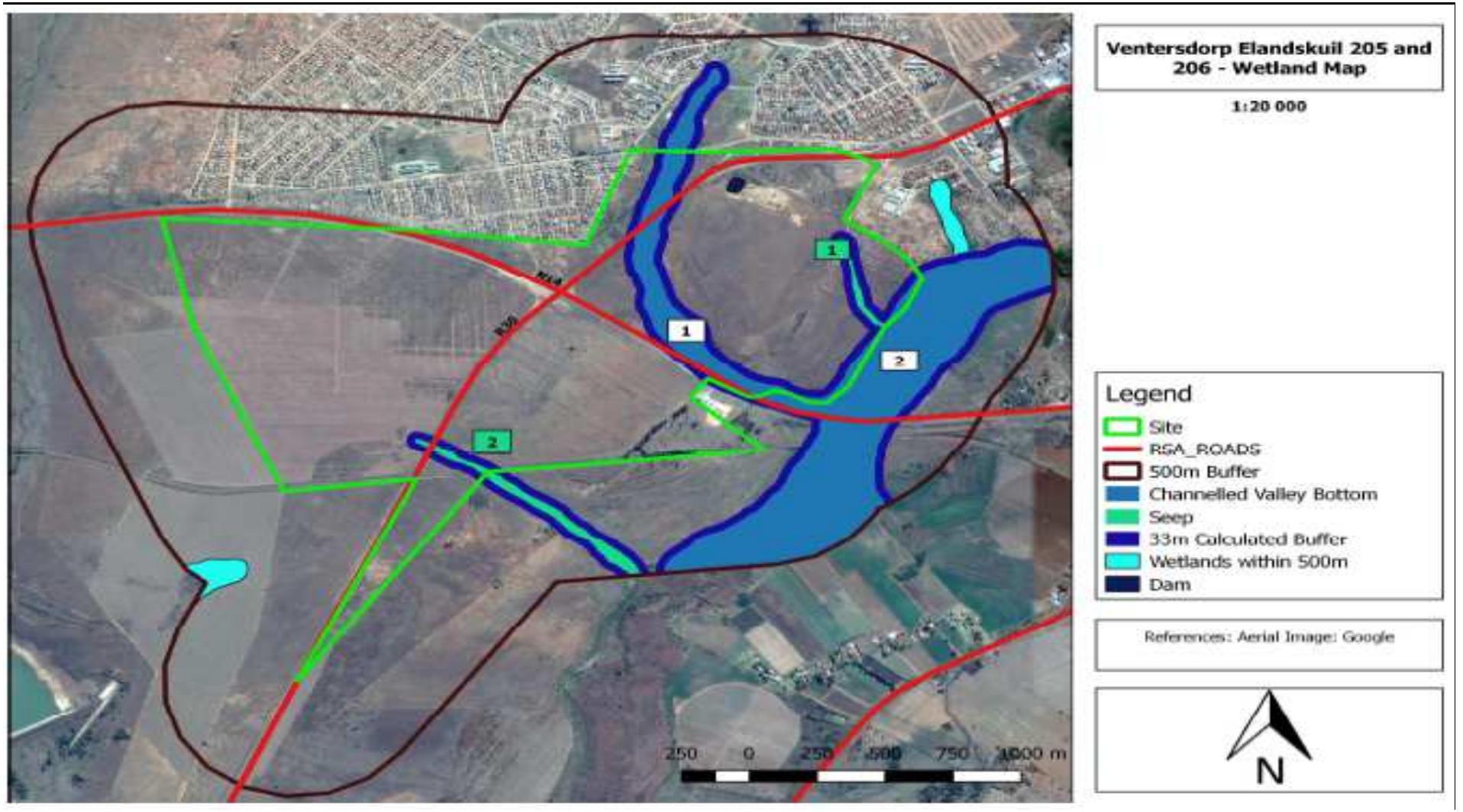


Figure 6: Proposed site of watercourse

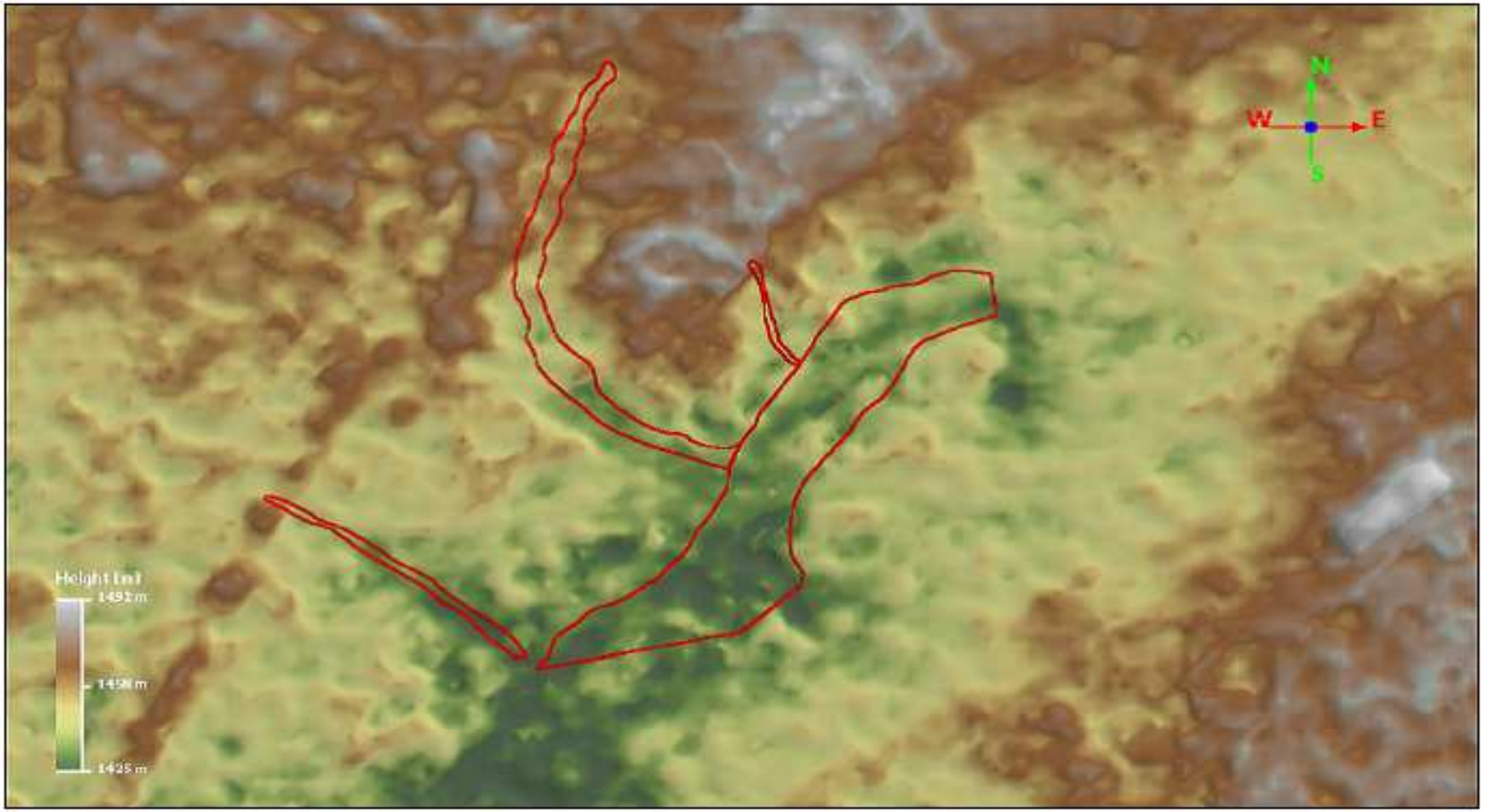


Figure 7: Digital Elevation Model indicating the landscape setting

The potential occurrence / non-occurrence of wetland areas within the footprint of the proposed development of the Integrated Human Settlement has been assessed according to the method contained within the DWAF guideline 'A practical field procedure for the identification and delineation of wetlands and riparian areas' (DWAF, 2005).

The guideline document stipulates that consideration should be given to four specific wetland indicators to determine whether an area is a wetland: These indicators are:

8.1 Terrain unit

Terrain Unit Indicator: Identifies those parts of the landscape where wetlands are likely to occur: Pans are usually concentrated in areas with an average slope of less than one degree and are characterised by a lack of integrated drainage. Inundation is usually seasonal or ephemeral. This indicator cannot be used for mapping, but is useful for screening (e.g. desktop screening assessment of where development is proposed in or alongside a valley bottom wetland or river). 1:50 000 topographic maps were used to generate digital base maps onto which the boundaries of the wetland can be delineated using Arcview 9.2. The terrain unit indicator is used for indicating the likely presence of wetlands, but not for delineation purposes.

8.2 Soil Form Indicator

Particular forms of soil are associated with wetlands and display hydromorphic characteristics, and their presence at a site indicates that permanent or periodic (temporary or seasonal) saturation of the soil near the surface occurs. Soils forms are also only indicators of possible wetland presence: i.e. on its own it is not sufficient information to rely on for wetland verification. The exceptions are the Katspruit, Champagne, Willowbrook and Rensburg soil forms which are mostly associated with permanent wetlands. No comprehensive soil survey has been undertaken for the site.

8.3 Vegetation Indicator

The presence of indicator plant species or hydrophytes can be used to denote the presence of wetlands. This indicator is very useful as verification of the boundaries in undisturbed sites. 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.

8.4 Soil wetness Indicator

This indicator refers to the colour of soil component is often the most diagnostic indicator of hydromorphic soils. Iron is what gives soil its red-brown colour; the reddish colour originates from iron-oxide (rust) – iron and oxygen. Wetland soils can be permanently, seasonally or temporarily saturated. This normally results in anoxic (low oxygen) conditions in the saturated zone. Soil colour is markedly influenced by the oxidation statues of manganese and iron. Yellow, red and reddish brown soil form under well-oxidised conditions and greyish colours when aeration is poorer. Under anoxic conditions, iron becomes soluble and can be leached out of the soil. Where the soil is permanently wet; the iron can all be dissolved out of the soil; resulting in a greyish or blueish colour.

This is termed gleying Prolonged periods of water saturation producing gleysation, where grey and blue mottles are form and are a condition in which hydrophilic plants flourish. Soils that are gleyed or organic soils indicate permanently saturated zones. Where the soil is only saturated on a seasonal basis (at least 3 months per year); the gleying may not be extensive. Instead, due to alternating periods of iron being dissolved and then oxidised, a mottled appearance develops in the soil. Consequently it is possible to identify wetland areas on the basis of soil colour, while mottle hue and chroma initially increase and then decrease the more saturated the soils.

According to the DWAF guidelines for the delineation of wetlands, soil wetness indicators are the most important indicator of wetland occurrence, due to the fact that soil wetness indicators remain in wetland soils, even if they are degraded or desiccated. The soil wetness indicators identify the ‘morphological signatures’ which develop in the soil due to frequent and prolonged saturation.

Soil colour should be used to assess whether a soil is hydromorphic, as colours of soil components are strongly influenced by the frequency and duration of soil saturation

(DWAF, 2003). Typically grey colours become more dominant as the soil is subject to greater levels of saturation. Coloured 'mottles' or redox concentrations are also indicators of hydromorphic soils, particularly in the seasonal and temporary zones of wetlands. These mottles are either nodules or concretions, masses (mottles), or pore linings (oxidized rhizospheres). These occur due to 'drying out' of wetland soils after having been saturated for a number of months at least, leading to the formation of patches of iron oxides (mottles) where the iron in the soil has been oxidised. This process often occurs along plant roots as these provide a route for oxygen to infiltrate the soil in an otherwise oxygen-poor environment (Breen, 1997).

Vegetation is a useful tool in determining wetland boundaries, although it does require that vegetation be in fairly good condition. A cautionary approach must be taken, however, as vegetation alone cannot be used to delineate a wetland; several species, while common in wetlands, can occur extensively outside of wetlands.

When examining plants within a wetland, a distinction between hydrophilic (vegetation adapted to life in saturated conditions) and upland species must be kept in mind. There is typically a well-defined 'wetness' gradient that occurs from the centre of a wetland to its edge that is characterised by a change in species composition between hydrophilic plants that dominate within the wetland to upland species that dominate on the edges of, and outside of the wetland (DWAF, 2003). It is important to identify the vegetative indicators which determine the three wetness zones (temporary, seasonal and permanent) which characterise wetlands. Each zone is characterised by different plant species which are uniquely suited to the soil wetness within that zone.

The soil form indicator examines soil forms, as defined by the Soil Classification Working Group (SCWG). Typically soil forms associated with prolonged and frequent saturation by water, where present, is an indicator of wetland occurrence (DWAF, 2005). The SCWG has identified the soil types that typically occur within the different zones typically found within a wetland, i.e. permanent, seasonal and temporary.

Terrain unit refers to the terrain unit in which the wetland is found. Wetlands can occur across all terrain units, from the crest to valley bottom. Many wetlands occur within valley bottoms, but wetlands are not exclusively found within depressions. Terrain unit is a useful indicator in assessing the hydro-geomorphic form of the wetland.

In practice all four indicators should be used in any wetland assessment / delineation exercise, but the soil wetness indicator is the most important indicator, with the other indicators being confirmatory. An understanding of the hydrological processes active within the area is also considered important when undertaking a wetland assessment. Indicators should be 'combined' to determine whether an area is a wetland and to delineate the boundary of a wetland. According to the DWAF delineation guidelines, the more wetland indicators that are present, and the higher the confidence of the delineation. In assessing whether an area is a wetland, the boundary of a wetland or a non-wetland area should be considered to be the point where indicators are no longer present. Where a boundary needs to be delineated, the boundary should be physically marked on site, and a contour between the various markers should be established, taking into account, however, localised changes to the boundary that are evident. The boundary should then be recorded (preferably digitally).

8.5 Present Ecological Status

The Present Ecological State (PES) refers to the current state or condition of a watercourse in terms of all its characteristics and reflects the change to the watercourse from its reference condition. The results from such an assessment are compared to the standard DWAF A-F ecological categories (Table 8) from where the PES/Habitat integrity of the wetland can be determined. The values give an indication of the alterations that have occurred in the wetland system

Ecological category	Score	Description
A	90-100%	Unmodified, natural
B	80-90%	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged
C	60-80%	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged
D	40-60%	Largely modified. A large loss of natural habitat, biota and

Ecological category	Score	Description
		basic ecosystem functions has occurred
E	20-40%.	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive F 0-20% Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible

Table 10: Present Ecological Status Categories of Wetlands (adapted from Kleynhans, 1996 & 1999).

The results from the PES analysis indicate the wetland to be in PES class C indicating that the wetland moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged. This can be ascribed to the effect of the polluted water from the oxidation pond.

8.6 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) of a watercourse is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales, and both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The ecological importance and sensitivity categories are indicated in Table 11.

EIS categories	Description
Low marginal	Not ecologically important and not sensitive to any scale. Biodiversity ubiquitous and not sensitive to flow and habitat (wetland play n insignificant role moderating water quality and quantity).
Moderate	Ecologically important and sensitive on provincial scale. biodiversity not usually sensitive to flow modifications (Wetland play a small role in

EIS categories	Description
	moderating water quantity and quality).
High	Ecologically important and sensitive and important. Biodiversity may be sensitive to flow and water quality and quantity.(Wetland play a role in moderating water quantity and quality).
Very high	Ecologically important and sensitive and important on a Nation or even international importance. Biodiversity is usually very sensitive to flow and water quality and quantity.(Wetland play a major role in moderating water quantity and quality.

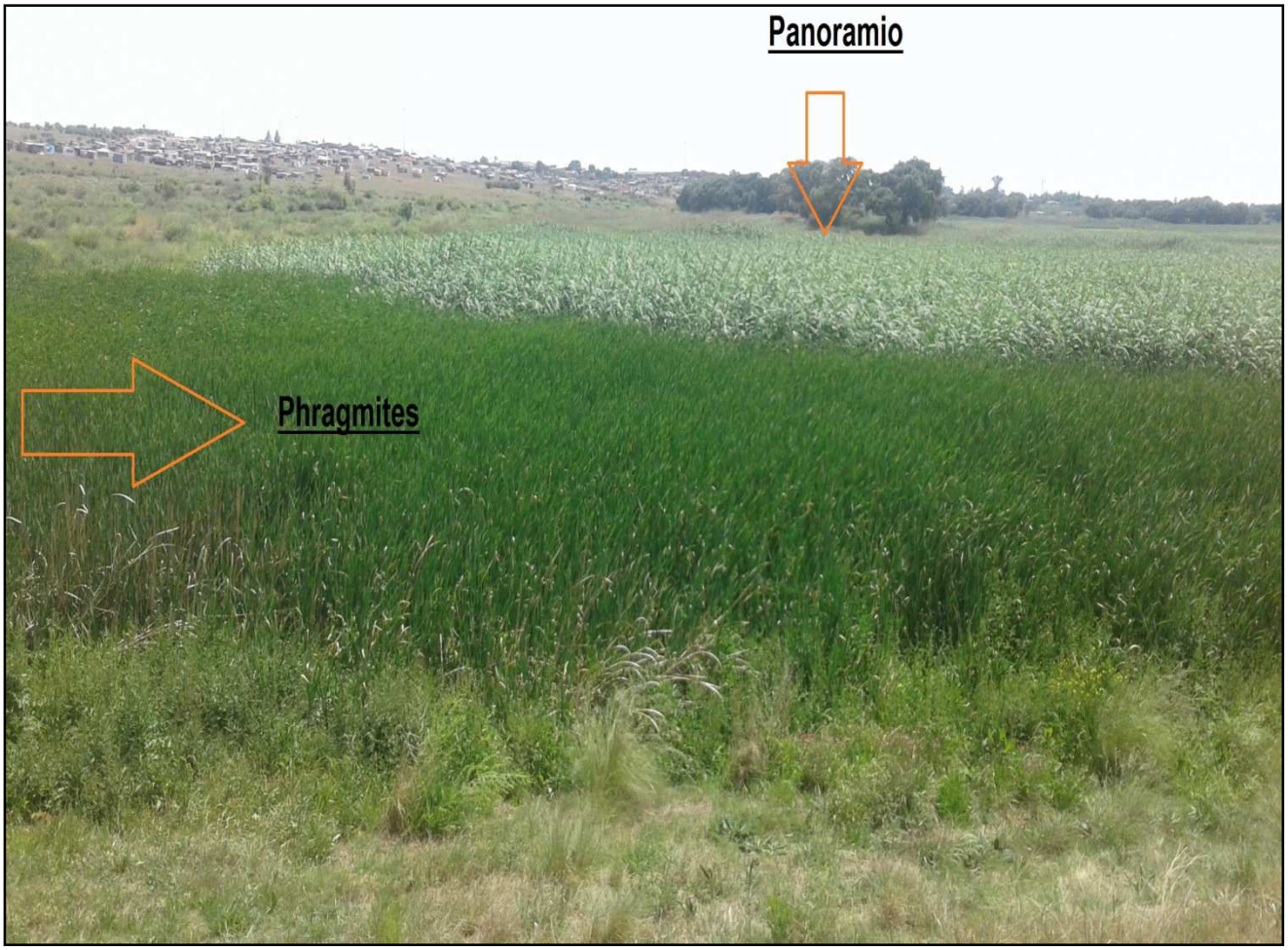
Table 11: Ecological Importance & Sensitivity Categories of Wetlands

The wetland area has an Ecological Importance and Sensitivity (EIS) it is regarded as being ecologically important or sensitive with a moderate biodiversity as it plays a role in moderating water quality and quantity. The wetland in discussion has been polluted by sewerage that has gained ingress to the wetland from the oxidation pond adjacent to the developmental site.

The wetland habitat on the developmental site occurs along the lower lying portion of the site. It is associated with a tributary of the Schoonspruit River and can be classified in terms of its hydro-geomorphic characteristics, wetland that receives both surface and subsurface water input Similar to other wetlands; the delineated wetland displays a gradient of wetness across its width.

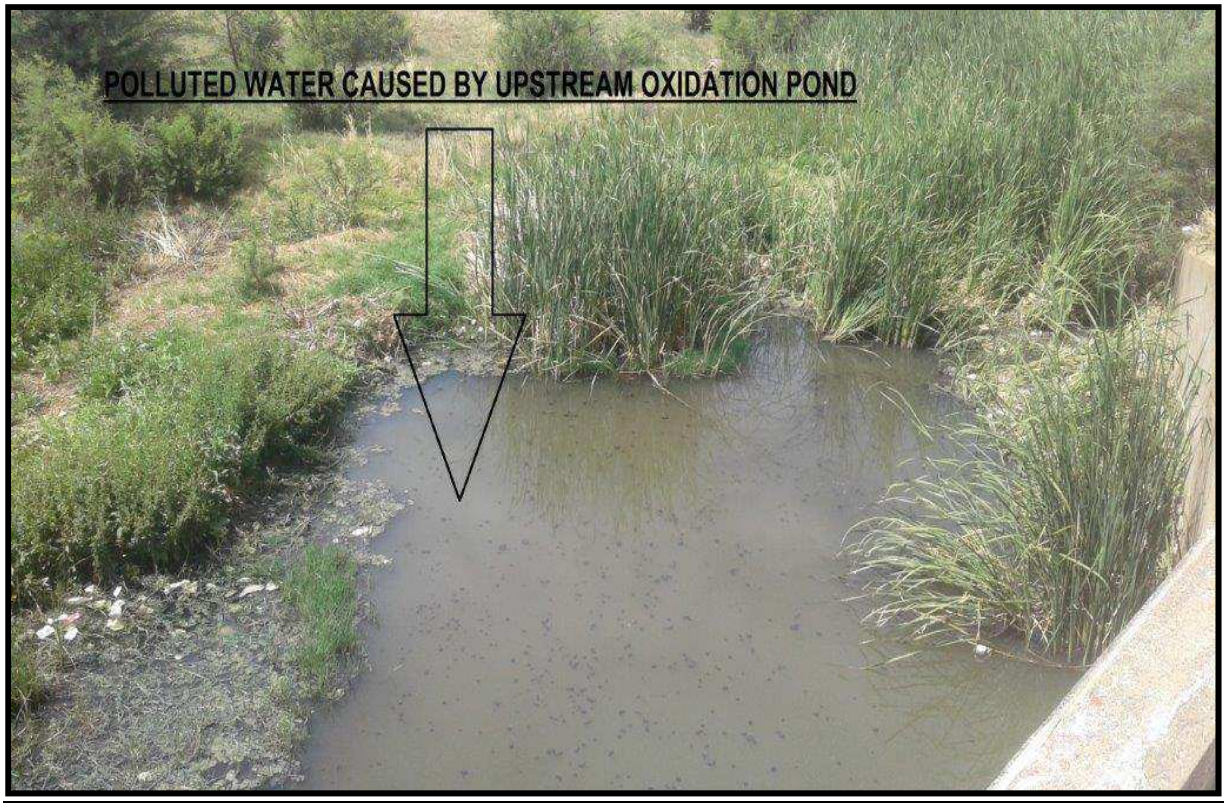
The vegetation of the central wet to moist portion of the wetland (permanently wet area) is dominated by a two types of vegetation hydrophyte Phragmites australis (Common Reed) and Panoramio (see photo below). Phragmites australis is the dominant wetland plant species inside the study area, as well as downstream of the study area where it forms similar large stands. It commonly forms extensive stands in moist and permanently wet (standing water of up 18 to 1 m deep) areas and can spread at a rate of 4-5 meters per year. The plant is known to form dense stands with little place for other plant species to also establish.

The dominance of Phragmites australis on the site is not only due to the wetness of the wetland area, but is also likely to be the result pollutantion of the oxidation pond upstream. It is a halophyte that can tolerate alkaline habitats and alkaline water.



*Picture 4: the vegetation found on site (*hydrophyte Phragmites australis and Panoramio (Common Reed)

Picture 5: Indicate proposed site below red line



Picture 6: Indicated Polluted water

SECTION B –IMPACT ASSESSMENT, MITIGATION AND EMPR CONTRIBUTION & CONCLUDING REMARKS

9 POTENTIAL AND LIKELY IMPACTS ON THE BIODIVERSITY RECEIVING ENVIRONMENT

Adherence to the stipulated mitigation measures on the report, the proposed activity is likely to result in minimal loss of natural habitat, no impacts of a beneficial nature on the biological/ biophysical environment are likely to result without significant mitigation intervention. Based on a generic list of impacts associated with this type of development, three categories of impacts are likely to result, namely, direct impacts, indirect impacts and impacts of a cumulative nature.

9.1 Nature of Anticipated and Likely Impacts

9.1.1 Direct Impacts

The largest extent of impacts within the biological environment is likely to result due to direct (physical) effects of land clearing activities and habitat loss. Direct impacts include any effect on the various habitat types, including locally endemic species, populations or individual species of conservation importance, as well as on overall species richness, diversity and abundance. These impacts include effects on genetic variability, population dynamics, overall species existence or health and on habitats important for species of conservation consideration. Loss of sensitive, restricted or protected habitat types are included in this category, but only on a local scale. These impacts are mostly measurable and easy to assess, as the effects thereof are immediately visible and can be determined to an acceptable level of certainty. Impacts of a direct nature include the following:

- Loss of plant taxa of conservation importance concern;
- Loss/ displacement of animal taxa of conservation importance;
- Loss of habitat associated with plant and animal taxa of conservation importance;
- Local depletion of plant taxa and reduction of phytodiversity;
- Local depletion/ displacement of faunal species and reduction of animal diversity;

- Loss of atypical, sensitive, conservation important habitat types or ecosystems of restricted abundance; and Loss and alteration of ecological processes and ecosystem services

91.3 Indirect Impacts

In contrast, indirect impacts are not always immediately evident and can consequently not be measured at a specific moment in time; 'spill-over effects' are spatially and temporally removed from the actual activity and manifestations are typically subtle. The extent of the effect is frequently at a scale that is larger than the actual site of impact, but usually restricted to a local scale (and not regional). A measure of estimation, extrapolation, or interpretation is therefore required to evaluate the importance of these impacts and is usually a factor of the sensitivity of the receiving surrounding environment. This type of impact typically results in adverse effects or deterioration of surrounding areas due to uncontrolled, development related activities.

In addition, the ecological functionality of the immediate and surrounding area could be adversely affected by development, with particular reference to the ecological interaction between plants and animals. Lastly, one of the most important impacts of indirect measures is represented by the alteration of biophysical characteristics of the surrounding areas through the introduction and proliferation of plants with an exotic nature or encroachment characteristics. Impacts of an indirect nature include the following:

- Impacts on habitat types that are associated with plants and animals of conservation importance (decreased habitat quality of surrounding areas due to peripheral impacts such as spillages, litter, increased erosion, contaminants, etc.);
- Alteration of faunal assemblages and community structures in surrounding areas (temporary displacement);
- Altered quality and ecological functionality (including fire, erosion) of surrounding natural habitat;
- Decreased aesthetic appeal of the landscape; and
- Exacerbated encroachment of invasive, exotic and encroacher plant species.

9.1.4 Cumulative Impacts

Lastly, impacts of a cumulative nature places direct and indirect impacts of this projects into a regional and national context, particularly in view of similar or resultant developments and activities in the region. Impacts of a cumulative nature typically adversely affect the local and regional conservation status of plant and animal taxa and protected habitat types as well as local and regional fragmentation levels, but also issues such as increased exploitation due to the exacerbation of anthropogenic activities on a local scale.

These impacts are notoriously problematic to control or prevent and frequently require huge financial commitments to mitigate. Impacts of a cumulative nature typically include the following:

- Increased plundering of natural resources due to increased human encroachment;
- Exacerbation of existing levels of habitat fragmentation and isolation; and
- Cumulative impacts on local/ regional and national conservation targets and obligations (loss of natural grassland habitat).

10 Method Statement

The following method is applied in estimating the significance of impacts within the natural (biological and biophysical) receiving environment.

Table 12: Impact Assessment Descriptive Criteria		
Nature	**Brief annotation on the impact**	
Probability	Categories 1 –5	
	1	Improbable (less than 24% chance of occurring)
	2	Probable (25 – 49%)
	3	Likely (50 – 69%)
	4	Very likely (70 – 89%)
	5	Definite (90 – 100%)

Table 12: Impact Assessment Descriptive Criteria		
Frequency	Categories 1 – 5	
	1	Very rare to remote (once or twice a decade)
	2	Unusual to occasional (once or twice every 5 years)
	3	Frequent (a few times a month)
	4	Very frequent (a few times a week, to daily)
	5	Continuous (daily to a significant percentage of every day)
	Categories 1 – 5	
Extent	1	Footprint / site
	2	Local
	3	Regional
	4	National
	5	International (trans-boundary)
Duration	Categories 1 – 5	
	1	Short (few days to a few months, less than a phase
	2	Short (few months, or less than a phase in total)
	3	Medium (a few years, significant part of a phase
	4	Long (lifespan of development (i.e. all of operation
	5	Permanent
Intensity	Categories 1 – 5	
	1	Very low – natural processes not affected
	2	Low – natural processes slightly affected
	3	Medium – natural processes continue but in a modified manner
	4	Medium-high – natural processes are modified significantly

Table 12: Impact Assessment Descriptive Criteria		
	5	High – natural processes disturbed significantly so that they cease to occur (temporarily /permanently)
Significance	**Significance = P + F + E + D + I**	
	Minimum value of 5, maximum of 25	
	Status determines if positive / negative	
	Any positive value	**No impact- 1.** High to low consequence, probability not an issue as positive, **no mitigation required**
	1-5	**Low -2.** Low consequence, probably, **minimal mitigation may be**
	6-10	**Medium-3.** Medium consequence, probably, **mitigation is advised / preferred**
	11-15	**Medium–high 4.** Medium to high consequence, probably to very probable, **mitigation is necessary**
	16-20	**High 5.** High consequence, probably / definite, **mitigation is essential**
	21to 25	**Extreme 6.** Very high consequence, definite, **fatal flaw!**

10.1 Impact Evaluation

10.1.1 Direct Impacts

Nature	**Direct loss of plant taxa of conservation importance concern**	
	Before	**Mitigation After Mitigation**
Probability	**5**	**1**
Frequency	**2**	**2**
Extent	**2**	**1**
Duration	**3**	**2**
Nature	**4**	**1**
Significance	**16**	**7**
Nature	**Loss/ displacement of animal taxa of conservation importance**	

	Before	Mitigation After Mitigation
Probability	**5**	**2**
Frequency	**4**	**4**
Extent	**3**	**2**
Duration	**4**	**3**
Significance	**21**	**15**
Nature	**Direct loss of habitat associated with plant and animal taxa of conservation importance**	
	Before	**Mitigation After Mitigation**
Probability	**2**	**1**
Frequency	**4**	**2**
Extent	**1**	**1**
Duration	**3**	**3**
Significance	**13**	**9**
Nature	**Loss/ displacement of animal taxa of conservation importance**	
	Before	**Mitigation After Mitigation**
Probability	**5**	**2**
Frequency	**4**	**4**
Extent	**3**	**2**
Duration	**4**	**3**
Significance	**21**	**15**
Nature	**Direct loss of habitat associated with plant and animal taxa of conservation importance**	
	Before	**Mitigation After Mitigation**
Probability	**2**	**1**
Frequency	**4**	**2**
Extent	**1**	**1**
Duration	**3**	**3**
Significance	**13**	**9**
Nature	**Local depletion of plant taxa and reduction of phytodiversity**	
	Before	**Mitigation After Mitigation**
Probability	1	1
Frequency	3	2
Extent	1	1
Duration	2	2
Significance	8	7
Nature	**Local depletion/ displacement of faunal species and reduction of**	

	animal diversity	
	Before	**Mitigation After Mitigation**
Probability	**1**	**1**
Frequency	**3**	**3**
Extent	**1**	**1**
Duration	**2**	**2**
Significance	**8**	**8**
Nature	**Loss of atypical, sensitive, conservation important habitat types or ecosystems of restricted abundance**	
	Before	**Mitigation After Mitigation**
Probability	**1**	**1**
Frequency	**3**	**2**
Extent	**1**	**1**
Duration	**2**	**2**
Significance	**8**	**7**
Nature	**Loss and alteration of ecological processes and ecosystem services**	
	Before	**Mitigation After Mitigation**
Probability	**1**	**1**
Frequency	**3**	**2**
Extent	**1**	**1**
Duration	**2**	**2**
Significance	**8**	**7**

10.1.2 Indirect Impacts

Nature	**Impacts on habitat types that are associated with plants and animals of conservation importance**	
	Before	**Mitigation After Mitigation**
Probability	**5**	**3**
Frequency	**4**	**4**
Extent	**2**	**2**
Duration	**4**	**3**
Significance	**17**	**15**
Nature	**Alteration of faunal assemblages and community structures in surrounding areas**	
	Before	**Mitigation After Mitigation**
Probability	**3**	**2**

Frequency	**4**	**4**
Extent	**2**	**2**
Duration	**4**	**3**
Significance	**15**	**13**
Nature	**Altered quality and ecological functionality (including fire, erosion) of surrounding natural habitat**	
	Before	**Mitigation After Mitigation**
Probability	**3**	**2**
Frequency	**4**	**2**
Extent	**2**	**2**
Duration	**4**	**2**
Significance	**15**	**9**
Nature	**Decreased aesthetic appeal of the landscape**	
	Before	**Mitigation After Mitigation**
Probability	**4**	**2**
Frequency	**2**	**1**
Extent	**2**	**2**
Duration	**5**	**2**
Significance	**15**	**8**
Nature	**Direct loss of habitat associated with plant and animal taxa of conservation importance**	
	Before	**Mitigation After Mitigation**
Probability	**2**	**1**
Frequency	**4**	**2**
Extent	**1**	**1**
Duration	**3**	**3**
Significance	**13**	**9**
Nature	**Exacerbated encroachment of invasive, exotic and encroacher plant species**	
	Before	**Mitigation After Mitigation**
Probability	4	2
Frequency	4	4
Extent	2	2
Duration	5	2
Significance	18	11

10.1.3 Cumulative Impacts

Nature	**Increased plundering of natural resources due to increased human encroachment**	
	Before	**Mitigation After Mitigation**
Probability	**4**	**2**
Frequency	**3**	**2**
Extent	**2**	**2**
Duration	**5**	**3**
Nature	**4**	**2**
Significance	**18**	**11**
Nature	**Exacerbation of existing levels of habitat fragmentation and isolation**	
	Before	**Mitigation After Mitigation**
Probability	**2**	**2**
Frequency	**5**	**4**
Extent	**2**	**2**
Duration	**5**	**3**
Nature	**1**	**2**
Significance	**18**	**13**
Nature	**Cumulative impacts on local/ regional and national conservation targets and obligations**	
	Before	**Mitigation After Mitigation**
Probability	**2**	**1**
Frequency	**5**	**2**
Extent	**2**	**1**
Duration	**5**	**2**
Nature	**1**	**1**
Significance	**15**	**7**

11 Mitigation Strategies & EMPr Contributions

11.1 Mitigation Hierarchy Background

The mitigation of negative impacts on biodiversity and ecosystem services is a legal requirement for authorisation purposes and must take on different forms depending on the

significance of the impact and the area being affected. Its application, is intended to strive to first avoid disturbance of ecosystems and loss of biodiversity, and where this cannot be avoided altogether, to minimise, rehabilitate, and then finally offset any remaining significant residual negative impacts on biodiversity, where:

Avoiding or preventing impacts – refers to considering options in project location, siting, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services, and people.

This is the best option, but is not always possible if the proposed development is to take place. However, there are areas where the environmental and social constraints are too high and development hould not take place. Such areas are best identified early in the development life cycle, so that impacts can be avoided. In the case of areas where environmental constraints might be limiting, this includes some ecosystems, habitats, ecological corridors, or areas that provide essential ecosystem services and are of such significant conservation value or importance that their loss cannot be compensated for (i.e. there is no substitute). In such areas, it is unlikely to be possible or appropriate to rely on the latter steps in the mitigation hierarchy (e.g. rehabilitating or offsetting impacts) to provide effective remedy for impacts on biodiversity or ecosystem services. Information about the location of many such areas is available, often making it possible to avoid them.

Minimising impacts – refers to considering alternatives in the project location, siting, scale, layout, technology and phasing that would minimise impacts on biodiversity and ecosystem services. Even in areas where the environmental and social constraints are not particularly high for mining to proceed/take place every effort should still be made to minimise impacts.

Rehabilitate impacts – refers to the rehabilitation of areas where impacts were unavoidable and measures are taken to return impacted areas to a condition ecologically similar to their 'pre-development natural state'. Although rehabilitation is important and necessary, unfortunately even with significant resources and effort, rehabilitation is a limited process that usually falls short of replicating the diversity and complexity of a natural system. Instead, rehabilitation helps to restore some resemblance of ecological functioning in an impacted landscape, to avoid on-going negative impacts, and/or to

provide some sort of aesthetic fix for a landscape. Rehabilitation should occur concurrently or progressively with the proposed activity, and/or on cessation of the activity.

Offset impacts –refers to compensating for remaining and unavoidable negative effects on biodiversity. When every effort has been made to minimise and then rehabilitate remaining impacts to a degree of no net loss of biodiversity against biodiversity targets, biodiversity offsets can provide a mechanism to compensate for significant residual negative impacts on biodiversity.

The mitigation hierarchy is inherently proactive, requiring the on-going and iterative consideration of alternatives of project location, siting, scale, layout, technology and phasing until the proposed development best 'suits' and can be accommodated without significant negative impacts in the receiving environment. In cases where the receiving environment cannot support the development (*e.g.* where the project will destroy the natural resources on which local communities are wholly dependent for their livelihoods or eradicate unique biodiversity), the development may not be feasible. Where biodiversity impacts can be severe, the guiding principle should be "anticipate and prevent" rather than "assess and repair". The proper application of the mitigation hierarchy is essential and requires a team of people with the relevant skills and knowledge.

Impacts	Mitigation
Potential Floristic impacts on the proposed site	• Avoid any surface disturbances within areas of high and medium-high floristic sensitive habitat types. In particular, the *Grassland* Patch and the Wetland Types are regarded particularly sensitive and any surface disturbances should be avoided at all cost. • Laydown areas, stockpiles, vehicle parking areas, road infrastructure, access roads, turning circles, maintenance areas, etc., should be planned and operated within areas of low sensitivity, also situated away from sensitive biodiversity areas and receptors. • Demarcate areas of high and medium-high floristic sensitivity by means of semi permanent means (fencing). Demarcation should be periodically inspected by the ECO in order to ensure that fencing remain intact. • Compile and implement a botanical monitoring plan that aims to establish the success, and build on, implemented mitigation measures. This monitoring protocol should be effected at least biannually (early summer, late summer) in

	order to identify impacts, recommend actions and ensure compliance; • Disturbance of vegetation must be limited only to areas of construction; • Removal of vegetation/ plants within natural habitat shall be avoided until such time as soil stripping is required; • The removal or picking of any protected or unprotected plants shall not be permitted and no horticultural specimens (even within the demarcated working area) shall be removed, damaged or tampered with, unless agreed to by the ECO; • Exposed surfaces must be re-vegetated or stabilised as soon as is practically possible by means of a typical rehabilitation plant mixture that blends in with the surrounding environment. The grass mix should consist of indigenous grasses adapted to the local environmental/ climatic conditions; • Revegetated areas should be temporarily fenced to prevent damage by grazing animals; • Monitoring the potential spread of declared weeds and invasive alien vegetation to neighbouring land and vice versa and protecting the agricultural resources and soil conservation works are regulated by the Conservation of Agricultural Resources Act (No 43 of 1983) and must be addressed on a continual basis, through an alien vegetation control and monitoring programme; • Prevent contamination of natural grassland and/ or wetlands from activities or any source of pollution; • Treatment of weeds and invasive species by means of herbicides and chemicals is not recommended as a result of the proximity to a wetland area;
Potential Faunal impacts on the proposed site.	• Avoid any surface disturbances within areas of high and medium-high faunal sensitivity habitat types. It must be ensured that none of the construction activities influence the natural faunal habitats of the study area; • The natural faunal habitats of the study area must be clearly demarcated to ensure that no unauthorized entry occurs; • All activities must be limited to daylight hours to mitigate impacts on sensitive nocturnal faunal assemblages; • No trapping, snaring or otherwise killing of animals should be allowed on or near the construction site; it is the responsibility of the construction site manager to ensure that

	this is enforced; • Ensure that a competent snake handler and capturing equipment is available at all times to remove snakes from the site and release captured animals in nearby suitable habitat; • No pets are allowed on the construction sites; species such as cats are known to decimate small animal populations; • Due care must be taken to ensure that no leakages of foreign materials (diesel, fuel, oil, etc.) occur, with particular reference to the Wetland Areas, • The ECO should ensure continual record keeping of all animal observations on site, with particular reference to snakes, aquatic mammals and other conservation important animals; • Compile and implement a faunal monitoring programme, the protocol of which should be effected at least biannually (early summer, late summer) in order to establish the continued persistence of animals on the adjacent sensitive areas, adherence to EMPr guidelines, the identification of impacts and guidance for mitigation measures; • Fencing and delineation of exclusion zones - the perimeter of sensitive sites must be fenced to prevent livestock access to these areas. No grazing, burning or agricultural activities are allowed within any of these areas without prior monitoring (see section below dealing with monitoring). Ideally, a buffer zone should also be included within the perimeter. • Burning - as general rule, burning (veld fires) is NOT allowed, especially during the Grass-owl breeding season between March and June. However, the vegetation structure and composition should be monitored on an annual basis to determine if the habitat meets the breeding requirements of Grass-owls. If the habitat is found to be sub-optimal or moribund and only when the area is not utilised by owls, it is recommended that the site be burned in spring after the first rains (to promote a cold burn of the graminoid cover). • Alien and invasive weeds – The area site should be monitored for the presence of alien and invasive weed species (such as *Acacia mearnsii, Melia azedarach, Opuntia ficus-indica,Eucapyptus* species, and *Cirsium vulgare*). All individuals of these species should be eradicated by means of manual labour and appropriate removal methods.
Biodiversity	• Appropriate dust control measures must be in place to limit

	the effects of dust pollution on the surrounding areas to acceptable levels. • A road management plan should be compiled prior to the commencement of construction activities; • Access to the site should take cognisance of the presence of sensitive habitat types, preferably placing access roads as far as possible from these areas; • No roads should be allowed within ecologically sensitive areas; • Areas subjected to land clearance must be kept to a minimum; • Appoint an Environmental Control Officer (ECO) prior to commencement of construction. Responsibilities should include, but not necessarily be limited to, ensuring adherence to authorisation requirements, EMPr guidelines, guidance of activities, planning, reporting; • The ECO must take appropriate action if the specifications contained in the EMPr are not followed; • No painting or marking of rocks or vegetation to identify locality or other information shall be allowed, as it will disfigure the natural setting. Marking shall be done by steel stakes with tags, if required; • The Project team will compile a Fire Management Plan (FMP) and Contractors directed by the ECO will submit a FMP. The Project FMP shall be include, *inter alia,* aspects such as relevant training, equipment on site, prevention, response, rehabilitation and compliance to the National Veld and Forest Fire Act, Act No. 101 1998; • Prevent all open fires; • Use of branches of trees, shrubs or any vegetation for fire making purposes is strictly prohibited; • The irresponsible use of welding equipment, oxy-acetylene torches and other naked flames, which could result in veld fires, or constitute a hazard and should be guided by safe practice guidelines; • The use of fire as a management tool in ecologically sensitive areas should be guided and instructed by a qualified ecologist and based on results and recommendations of a biodiversity monitoring protocol; • Provide demarcated fire-safe zones, facilities and suitable fire control measures; • Cleared vegetation and debris that has not been utilised will

	be collected and disposed of to a suitable waste disposal site; it will not be burned on site; • Remove and store topsoil separately in areas where excavation/ degradation takes place. Topsoil should be used for rehabilitation purposes in order to facilitate re-growth of species that occur naturally in the area; • Stored topsoil will be free of deleterious matter such as large roots, stones, refuse, stiff or heavy clay and noxious weeds, which would adversely affect its suitability for planting; • No spoil material will be dumped outside the defined site; • Provide temporary on-site ablution, sanitation, litter and waste management and hazardous materials management facilities; • Abluting anywhere other than in provided toilets shall not be permitted. Under no circumstances shall use of the veld be permitted. • Prevent any and all defacement of natural features, no permanent markings (paint, concrete, etc) shall be allowed. Temporary markings should be environmentally-friendly; • Develop and implement a dedicated hydro-carbon spill action plan, which shall include prevention (drip trays, bunding, etc.) and reactionary (spill kits, biological cleaning agents, etc.).
Critical Biodiversity Area	• Maintain biodiversity in near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted. • These natural corridors are often best suited for grazing, and only small portions should be ploughed or developed for settlement. • Activities within the boundaries of this area aspects such as maintaining a balanced interaction between society and nature, protecting the diversity of landscapes and habitats and preserving traditional land use and other activities of the local population.
Wetlands	• The wetland need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services, however the wetland present onsite of has been polluted due to the malfunctioning oxidation pond at the periphery of the development site. Rehabilitation and cleanup by the Municipality has to be effected to prevent further pollution and further degradation of the stream and

	wetland area. • the implementation of a suitable buffer zone (at least 50m) between the edge of wetlands (high and medium-high sensitivity) areas and any type of development or surface disturbance.

12. Conclusion and Recommendation

The direct impacts of the development of the Integrated Human Settlement on biodiversity was analysed in a desktop study and were to found to be generally medium low impacts provided the recommendations on the mitigation measures are adhered to. The proposed site of development is in within the Critical Biodiversity Area (CBA1) as per the North West Province Biodiversity Sector plan, the conservation status of the habitat is endangered although not protected.

The area which falls under CBA type 1, ideally, these parts of the landscape need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity capability of the areas is lost and the conservation targets cannot be met.

The biodiversity of the area has already been substantially reduced due to ongoing pressures of developments and unsustainable resource use, the site has been occupied by informal settlements and also waste is being dumped on site allowing development on site will curb further degradation of the area and pollution of the wetlands.

Critical Biodiversity Area type 1 is known to contain Red data species and Endemic species however based on the site visit conducted no red data species were identified. The absence of Red data species and endemic species is likely to be a result of impairment by human activities and pollution of the wetland.

The wetland on site falls under category C of the Present Ecological Status which is moderately modified, loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged. Therefore wetland plays a critical role in the provision of goods and services and must be protected and further pollution must be stopped.

Rivers tributatories and wetlands are an essential part of an equitable and sustainable water resource strategy and therefore need to stay in a good condition in order to contribute to the national biodiversity goals and to conserve freshwater ecosystems and protect water resources for human use. Buffer zone of at least 50m to the site of ecological importance should be determined consequently be fenced off from human use, and rather should be supported by good planning, decision-making and management to ensure that human use does not impact on the condition of the ecosystem.

Rivers and wetlands in category A or B are regarded as being in good condition however it's not the case on the site due to pollution (condition lower than A or B) as a result of unmanaged overflowing sewage onsite. Ecological category description of the wetland and rivers are moderately modified. It is recommended that Wetland onsite should be rehabilitated to the best attainable ecological condition.

The most common recommendation for the proposed site was to ensure the protection and conservation of specific critical biodiversity areas and thus supporting biodiversity in close proximity of facilities. The following recommendations are made:

- In close proximity of an Irreplaceable or Important CBA, operations/development must be stringently avoided to prevent any degradation of the biodiversity. No future development in these areas is allowed.
- A scientifically calculated buffer of 33m is considered appropriate for this site. The delineated wetlands, together with the buffer zones should be considered as a sensitive area and excluded from the development footprint. It is further important to take the position of the watercourse within landscape (Figure 7) into consideration when planning development as this is the area where water will flow and accumulate.
- Ensure activities associated with the development do not disrupt ecological services, rehabilitation ecosystems supporting and contribute to improving habitat for endangered species by supporting habitat restoration.
- Wetlands and water courses in close proximity of the development must be guarded against direct or indirect pollution of all water courses, especially water and soil

pollution through spillage, run-off, stormwater must be prevented, pollution needs to be contained.

- Adhere to all environmental legislation, consider monitoring of water bodies of high natural ecological value also be ensuring that water flow is not disrupted.

REFERENCES

1. Conservation assessment and management plan for southern African frogs. Final Report. IUCN/SSC Conservation Breeding Specialist Group: Apple Valley, MN. Bathusi Environmental Consulting (BEC) Terrestrial biodiversity basic impact assessment for the proposed rehabilitation of Rietspruit Dam near Ventersdorp, North West Province.

2. Department of Water Affairs and Forestry. (1996). South African Water Quality Guidelines (second edition). Volume 7: Aquatic Ecosystems.

3. DWAF, Pretoria. Department of Water Affairs and Forestry. (2005) A practical field procedure for identification and delineation of wetlands and riparian areas (edition 1).

4. DWAF, Pretoria. Friedmann, Y. and Daly, B, (editors) (2004) Red Data Book of the mammals of South Africa: a conservation assessment: CBSG southern Africa, Conservation Breeding Specialist Group (SSC/IUCN). Endangered Wildlife Trust, South Africa.

5. Gauteng DACE (2009) Minimum requirements for biodiversity assessments. Gauteng Department of Agriculture, Conservation and Environment, Johannesburg, South Africa.

6. Gerber, A., Cilliers, C.J., van Ginkel, C. and Glen, R. (2004) Easy identification of aquatic plants – a guide for the identification of water plants in and around South African impoundments. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria.

7. Gibbon, G., John Voelcker Bird Book Fund (2002) Roberts' multimedia birds of southern Africa – version 3. Southern African Birding CC, Westville, South Africa. Harrison J. A., Burger M., Minter L. R., De Villiers A.L., Baard E. H. W., Scott E., Bishop & Ellis S. (2001).

8. *Maps of the regional area of Ventersdorp*, Maps, Mahikeng: Lesekha consulting, 2017, *Integrated Human Settlement Developmen*t.

9. North West Department of Rural, Environment and. Agricultural Development (READ). (2015) North. West Biodiversity Sector Plan.

10. South African National Biodiversity Institute's BGIS; http://bgis.sanbi.org/WCBF14/project.asp). (Accessed on the 22 November 2017,14:36)

Appendix A : List of Red Data Species