HENKRIES MEGA-AGRIPARK DEVELOPMENT

The proposed development of ±150 ha of high potential agricultural land at Henkries (Northern Cape)

BIODIVERSITY & BOTANICAL SCAN

A biodiversity scan of affected area to identify possible significant environmental features and to evaluate the potential impact on such features.

28 February, 2016

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REQUESTED BY: Department of Agriculture, Land Reform and Rural Development

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INDEPENDENCE & CONDITIONS

PB Consult is an independent consultant and has no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and PB Consult have no interest in secondary or downstream development as a result of the authorization of this proposed project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. PB Consult reserve the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALITFICATIONS & EXPERIENCE OF THE AUTHOR

Mr. Peet Botes holds a BSc. (Hons.) degree in Plant Ecology from the University of Stellenbosch (Nature Conservation III & IV as extra subjects). Since qualifying with his degree, he had worked for more than 20 years in the environmental management field, first at the Overberg Test Range (a Division of Denel) managing the environmental department of OTB and being responsible for developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve). In 2005 he joined Enviroscientific, an independent environmental consultancy specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits. During 2010 he joined EnviroAfrica in order to move back to the biodiversity aspects of environmental management. Experience with EnviroAfrica includes EIA applications, biodiversity assessment, botanical assessment, environmental compliance audits and environmental control work.

Mr. Botes is also a registered Professional Environmental and Ecological Scientists at SACNASP (South African Council for Natural Scientific Professions) as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005.

Yours sincerely,

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SUMMARY - MAIN CONCLUSIONS

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SUMMARY OF POSSIBLE SIGNIFICANT BIODIVERSITY FEATURES			
Geology & soils (Refer Par. 5.4)	A detailed soil study was performed by Digital Soils Africa (3 December 2014). According to this study soils are very similar throughout the study area.	The Dundee soil form covers the whole area, with a poorly expressed orthic A horizon. The texture is sand with 37 % gravel fragments on average. The gravel is of a variety of sizes. Similar soils are expected to cover most of the surroundings and are only broken by alluvial deposits next to the river. The proposed development will have a direct impact on 150 ha of soils. No special features have been encountered and in terms of geology and soils the site is considered of low sensitivity.	
		Without mitigation: Low	**With mitigation: Low**
Land use and cover (Refer Par. 5.5)	The proposed footprint will be localised, but will impact on grazing land utilized by at least two families.	The proposed project will be located on communal land owned by the Municipality, and is currently used as grazing for goats by local inhabitants (at least two families). It is a fact that this area has a very low carrying capacity and that the proposed project should result in significant social investment and job creation. However, the families relying on this land for its grazing will have to be given alternative grazing areas or will have to benefit in some other way from this project. Mitigation should entail, relocating the families onto similar grazing land or compensating them in some other way.	
		Without mitigation: High	**With mitigation: Low**
Potential impacts on threatened or protected ecosystems			
Vegetation type(s) (Refer Par. 5.7 & 5.8)	Eastern Gariep Rocky Desert covers the terrain.	The vegetation type is classified as "Least threatened" with approximately 99.7% of this vegetation type remaining. However, at present, none of this vegetation type is formally conserved. Still it is considered highly unlikely that the proposed project will have any significant impacts on local or regional conservation targets. Mitigation: maintain the corridor function of the surrounding rocky desert areas.	
		Without mitigation: Low	**With mitigation: Low**
Conservation priority areas/networks and connectivity. (Refer Par. 5.11)	Namakwa District Biodiversity Sector Plan (Desmet & Marsh, 2008)	According to the CBA map for the Henkries area (Figure 7) the proposed site and almost the whole of Henkries are located within a proposed CBA 1. Ideally the proposed site should have been placed outside of the proposed CBA. In this case there is no land available at Henkries that will place a development of this size outside of the proposed CBA areas and still within easy access of irrigation. This is also the only and most likely area for any such agricultural development near to the existing agricultural hub. Mitigation: maintain the corridor function of the surrounding rocky desert areas coupled with alien eradication.	
		Without mitigation: Medium	**With mitigation: Low**
Protected plant species (Refer Par. 5.10)	Sixteen (16) individuals of Boscia albitrunca (Protected in terms of the NFA) were encountered spread throughout the site. Seven plant species protected in terms of the	Sixteen trees listed in terms of the NFA trees were encountered within the larger site. However, only 7 of these trees are within the proposed footprint and with slight alterations, more of these trees can be safed. Previous experience showed that both Camelthorn and Sheppard's tree have deep root systems, which mean excavation can be done quite close to the tree without impacting on the root system. It is unavoidable that a number of plants protected in terms of the NCNCA will	

	NCNCA was observed. However, a number of these were common pioneer species from the Aizoaceae family.	be impacted by the proposed development. However, most of these species are common pioneer species and the impact on the populations of these species will be negligible. Mitigation should entail excellent environmental control, slight layout alterations to avoid as many mature indigenous tree species as possible; good topsoil conservation and rehabilitation practices; and application for permits in terms of the NFA and the NCNCA.	
		Without mitigation: Medium	**With mitigation: Low**
Fauna & Avi-fauna (Refer Par. 5.12)	Although natural fauna and avi-fauna is likely to be present, it is expected that it would be limited to small game, avi-fauna, insects and maybe some reptile's species.	Human activity in the area is medium-high and the property is grazed by at least two families. **Mammals**: The site visit showed very little evidence of the presence of game species (e.g. droppings, skeletons etc.) The Henkries area encompasses a very large range of natural veld and it is highly unlikely that the proposed development will have a significant impact on habitat or migration routes. **Reptiles**: The open sandy plains, is not expected to house great numbers of reptile species (limited cover). The surrounding rocky outcrops, on the other hand, will have much more cover and habitat features favoured by a larger variety of reptile species. As a result, the impact on reptiles should be negligible. **Amphibians**: No suitable breeding places were observed on the proposed site and it is highly unlikely that the proposed development will have any significant impact on amphibian species. **Avi-fauna**: The open sandy open plain is likely to provide a habitat for certain bird species as will the small number of full grown indigenous trees that were encountered on site. However, shelter, food and the number of trees and other edibles is a rarity and unlikely to attract bird species in great numbers and the proposed development is not expected to have a significant impact on indigenous avi-fauna. The planting of vineyards and date palms, on the other hand, is likely to attract a number of fruit and insect eating bird species (and their predators). Mitigation should entail minimising the impact on indigenous tree species.	
		Without mitigation: Low	**With mitigation: Low**
Rivers & wetlands (Refer Par. 5.6)	No rivers or streams were observed, but a few episodic, non-perennial drainage channels were observed.	The proposed development will be located on an open sheet washed valley floor with a very low gradient within a hyperarid region. Much of this rainfall is experienced in thunder storms. Rainfall can at best be described as episodic or sporadic, and water will only flow for very short periods of time (Non-perennial), with intervals that can vary greatly. As a result the soils will rarely be inundated for longer than a couple of days at a time (if so long). Mitigation will ensure that the development incorporate storm water management (drainage of water during thunderstorm events).	
		Without mitigation: Low	**With mitigation: Low**
Invasive alien infestation (Refer Par. 5.13)	A few *Prosopis* species were observed scattered throughout the property.	At present the infestation is low, but it is vital that the further spreading of this species is stopped. All listed invasive alien species must be removed from the property. However, incorrect alien control methods used for especially *Prosopis* species may aggravate the situation and result in spreading in place of control of these species. Mitigation will entail correct alien control methods coupled with follow up work after rehabilitation.	
		Without mitigation: Low	**With mitigation: Positive**
Potential direct impacts			
Direct impacts	Refers to those impacts with a direct impact on biodiversity features.	The proposed project will have a direct impact on 150 ha of natural vegetation (least threatened), which includes protected plant species. It will have a significant impact on two families utilising the grazing land, and is likely to have a low impact on a very limited number of fauna species, but might result in a positive impact on a number of avi-fauna (attracted by the fruit of the harvest). Impact is considered real, but not substantial. Mitigation will include all the mitigation aspects discussed above.	
		Without mitigation: Medium	**With mitigation: Low**
Potential indirect impacts			
Indirect impacts	Refers to impacts that are	The proposed project will have indirect impacts like the establishment of	

	not a direct result of the main activity, but are impacts associated or resulting from the main activity.	temporary lay-down areas, reservoirs, temporary construction sites and concrete mixing areas. However, with good environmental control it will be possible to minimise the impact of such indirect impacts. Mitigation will entail excellent environmental control and rehabilitation in accordance with approved management plans, placement of temporary lay-down areas or construction sites within areas that are not environmentally sensitive and will not impact on protected plant species. It will also entail good waste and wastewater control.	
		Without mitigation: Medium	**With mitigation: Low**
Potential cumulative impacts			
Cumulative impacts	Refers to the cumulative loss of ecological function and other biodiversity features on a regional basis.	The proposed project will have a permanent but localised impact. However, it is considered unlikely that the cumulative impact will result in significant additional impact on local or regional biodiversity targets, but it will have a localised impact on protected plant species and on the grazing rights of at least two families (although carrying capacity is very low). Mitigation will entail excellent environmental control and all of the mitigation measures addressed above.	
		Without mitigation: Medium	**With mitigation: Low**
The No-Go Option			
The No-Go Option	The "No-Go alternative" does not signify significant biodiversity gain or loss especially on a regional basis.	The loss of full grown protected tree species, the potential impact on natural fauna and the potential impact on land-use and grazing rights will be negated. However, it will prevent a considerable socio-economic investment and job creation. One of the main issues of this area being very limited job opportunities. The no-go option will mean that these potential economic gains will be lost to the province.	

RECOMMENDATION

It is expected that the proposed establishment of a Mega-Agripark at Henkries act as a significant stimulus to the economy of this region. It is proposed that through agriculture, sustainable economic growth, job creation and economic empowerment of this community will be promoted. The scope of the Henkries project will be to develop approximately 130-150 ha of high potential arable land near Henkries. This development is designed to act as catalyst for the development of a further 3 000 ha of arable land which is located in eleven distinct areas of the Namaqualand District.

It is, considered highly unlikely that the proposed project will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity

Good environmental planning and control during construction and good rehabilitation after construction will ensure that environmental impacts are minimised throughout the construction phase.

With the available information to the author's disposal it is recommended that the project be approved, but that all mitigation measures described in this document is implemented.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PHOTOS

1. INTRODUCTION

Henkries is an agricultural settlement near the Orange River, 13 km west of Goodhouse, Northern Cape Province. Derived from Khoekhoen, the name, also encountered as Henkrees, Henkeriss and Hamneries, means *'mountain slope'*(www/en.wikkepedia.org). Henkries relies almost exclusively on irrigated agriculture supplied with water from the Orange River. Namaqualand is an arid to semi-arid area situated in the northwest corner of South Africa, bordered by the Orange River to the North. Large areas of arable soil can be found on the banks of this river and the proximity to irrigation water creates attractive opportunities for development of intensive agricultural development. Namakwa district is one of very few areas in South Africa where high quality arable land together with water licenses from the Orange River are readily available for the economic development of local communities.

Agricultural development has the potential to unlock the economy of this region through irrigated farming with high value crops. The Northern Cape Department of Agriculture Land Reform and Rural Development proposes the establishment of a Mega-Agripark at Henkries in order to stimulate the economy of this region, through agriculture, in order to promote sustainable economic growth, job creation and economic empowerment of this community (Draft Henkries Development Plan, 31July 2015). The proposed Henkries development forms part of the Orange River Emerging Farmer Settlement and Development Program which centres on economic growth, the development of rural communities and economic empowerment through the development of irrigation land into intensive agricultural production units in the Northern Cape.

The scope of the Henkries project will be to develop approximately 130-150 ha of high potential arable land near Henkries. This development is designed to act as catalyst for the development of a further 3 000 ha of arable land which is located in eleven distinct areas of the Namaqualand District. The basket of products to be produced varies from cash crops such as lucerne and grains, but the bulk of the development is aimed at high value crops with export potential in order to secure significant growth on the required investment. These products will be marketed through a central distribution center and processing facility earmarked to be developed in the Springbok Industrial Zone.

The proposed development will also include the establishment of two reservoirs and an extraction point at the existing Henkries Pump Station.

Since these areas are still covered by natural veld a Biodiversity Scan of the proposed location was commissioned in order to evaluate the environmental impact(s) of the proposed project and to establish whether further and more in depth studies would be required.

1.1 TERMS OF REFERENCE

EnviroAfrica (Pty) Ltd was appointed by the Department of Agriculture, Land Reform and Rural Development as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and Environmental Impact Assessment (S&EIA) for the proposed development. PB Consult was appointed by EnviroAfrica to conduct a Biodiversity Scan of the proposed site.

PB Consult was appointed within the following terms of reference:

- Complete a Biodiversity Scan of the proposed site in order to determine whether any significant features will be impacted as a result of the proposed development.
- Make recommendations on impact minimisation should it be required
-
- Consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

The study includes the following:

- A brief discussion of the local environment and ecological drivers associated with the specific area.
- A brief discussion of the vegetation types encountered with emphasis on protected species.
- A list of plant species encountered.
- Determination of the occurrence, or possible occurrence of threatened or sensitive plant species, and sensitive plant communities, on the basis of the field survey and records obtained from the South African National Biodiversity Institute (SANBI) and available literature.
- Assessment of habitat sensitivity, incorporating faunal distribution on the hand of the field survey and from available literature.
- An evaluation of the potential impact on habitat and species.
- A discussion of significant impacts *vs*. mitigation and possible layout amendments.

2. APPLICABLE LEGISLATION

Constitution of the Republic of South Africa (1996): of special relevance in terms of environment is section 24

Conservation of Agricultural Resources Act 43 of 1983 (CARA): supports conservation of natural agricultural resources (soil, water, plant biodiversity) by maintaining the production potential of the land and combating/preventing erosion; for example, by controlling or eradicating declared weeds and invader plants.

Hazardous Substances Act 15 of 1973: to control substances that may cause injury, ill-health, or death through their toxic, corrosive, irritant, strongly sensitizing or flammable nature, or by the generation of pressure

National Environmental Management Act 107 of 1998 (as amended): replaces the Environmental Conservation Act (ECA) and establishes principles for decision-making on matters affecting the environment, and for matters connected therewith.

- **Environmental Impact Assessment Regulations** (2014): procedures to be followed for application to conduct a listed activity.

National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA): replaces the Atmospheric Pollution Prevention Act (No. 45 of 1965).

National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA): supports conservation of plant and animal biodiversity, including the soil and water upon which it depends.

- **National list of ecosystems that are threatened and in need of protection** (GN 1002 of 9 December 2011).

National Environmental Management: Protected Areas Act 57 of 2003 (as amended Act 31 of 2004) (NEMPAA): To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes.

National Environmental Management: Waste Act 59 of 2008 (NEMWA): To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

- **List of Waste Management Activities that have, or are likely to have a detrimental effect on the environment** (GN 718 of 3 July 2009): Identifies activities in respect of which a waste management license is required.

National Forests Act 84 of 1998 (as amended): supports sustainable forest management and the restructuring of the forestry sector.

- **List of protected tree species** (GN 716 of 7 September 2012)

National Heritage Resources Act 25 of 1999: supports an integrated and interactive system for the management of national heritage resources, including supports soil, water and animal and plant biodiversity.

National Veld and Forest Fire Act 101 of 1998 (NVFFA): protects soil, water and plant life through the prevention and combating of veld, forest, and mountain fires

National Water Act 36 of 1998 (NWA): promotes the protection, use, development, conservation, management, and control of water resources in a sustainable and equitable manner.

Northern Cape Nature Conservation Act 9 of 2009 (NCNCA): To provide for the sustainable utilization of wild animals, aquatic biota and plants.

2.1 NORTHERN CAPE NATURE CONSERVATION ACT 9 OF 2009

On the 12th of December 2011, the new Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect, which provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the act give extensive lists of specially protected and protected fauna and flora species in accordance with this act. The NCNCA is a very important Act in that it put a whole new emphasis on a number of species not previously protected in terms of legislation.

It also put a new emphasis on the importance of species, even within vegetation classified as "Least Threatened" (in accordance with GN 1002 of 9 December 20011, promulgated in terms of the National Environmental Management Biodiversity Act 10 of 2004). Thus even though a project may be located within a vegetation type or habitat previously not considered under immediate threat, special care must still be taken to ensure that listed species (fauna & flora) are managed correctly.

3. DEFINITIONS & ABBREVIATIONS

3.1 DEFINITIONS

Construction: means the period of the project during which the actual works are carried out, deemed to include site establishment, site preparation, the works, maintenance period and decommissioning.

Construction site: means the area influenced and affected by the construction activities or under the control of the Contractor often referred to as "the Site".

Contaminated water: means water contaminated by the Contractor's activities, *e.g.* concrete water and runoff from plant/ personnel wash areas.

Environment: means the surroundings within which humans exist and that are made up of:

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part of the combination of the above two bullets and the interrelationships between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being

Environmental Aspect: any element of any construction activity, product or services that can interact with the environment.

Environmental Control Officer: a suitably qualified environmental agent responsible for overseeing the environmental aspects of the Construction phase of the EMP.

Environmental Impact: any change to the environment, whether adverse or beneficial, wholly or partially resulting from any construction activity, product or services.

No-Go Area(s): an area of such (environmental/aesthetical) importance that no person or activity are allowed within a designated boundary surrounding this area.

Owner: the owner, or dedicated person, responsible for the management of the property on which the proposed activity will be performed.

Solid waste: means all solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Precautionary principle: means the basic principle, that when in doubt or having insufficient or unreliable information on which to base a decision, to then limit activities in order to minimise any possible environmental impact.

Watercourse: in this report the author uses a very simplified classification system to define the difference between rivers, streams or a drainage lines encountered in the Northern Cape.

- River: A river is a natural watercourse with a riverbed wider than 3m, usually freshwater, flowing toward an ocean, a lake, a sea or another river. In a few cases, a river simply flows into the ground or dries up completely before reaching another body of water. The flow could be seasonal or permanent.

- Stream: A small river or natural watercourse with a riverbed of less than 3 m, usually freshwater, flowing toward an ocean, a lake, a sea or another river. In a few cases, a river simply flows into the ground or dries up completely before reaching another body of water. The flow could be seasonal or permanent.
- Drainage line: A very small and poorly defined watercourse, mostly on relatively flat areas, which only flows for a short period after heavy rains, usually feeding into a stream or river or dries up completely before reaching another body of water.

3.2 ABBREVIATIONS

BGIS	Biodiversity Geographical Information System
CARA	Conservation of Agricultural Resources Act 43 of 1983
CBA	Critical Biodiversity Areas (Municipal)
DAFF	Department of Agriculture Forestry and Fisheries
DEA	Department of Environmental Affairs
DENC	Department of Environment and Nature Conservation (Northern Cape Province)
EAP	Environmental assessment practitioner
EIA	Environmental impact assessment
EMF	(Municipal) Environmental Management Framework
EMP	Environmental management plan
NCNCA	Northern Cape Nature Conservation Act 9 of 2009
NEMA	National Environmental Management Act, Act 107 of 1998
NEMAQA	National Environmental Management Air Quality Act 39 of 2004
NEMBA	National Environmental Management Biodiversity Act, Act 10 of 2004
NEMPAA	National Environmental Management Protected Areas Act 57 of 2003
NEMWA	National Environmental Management Waste Act 59 of 2008
NFA	National Forests Act 84 of 1998
NSBA	National Spatial Biodiversity Assessment
NVFFA	National Veld and Forest Fire Act 101 of 1998
NWA	National Water Act 36 of 1998
SABIF	South African Biodiversity Information Facility
SANBI	South African National Biodiversity Institute
SIBIS	SANBI's Integrated Biodiversity Information System
SKEP	Succulent Karoo Ecosystem Project
WWTW	Wastewater Treatment Works

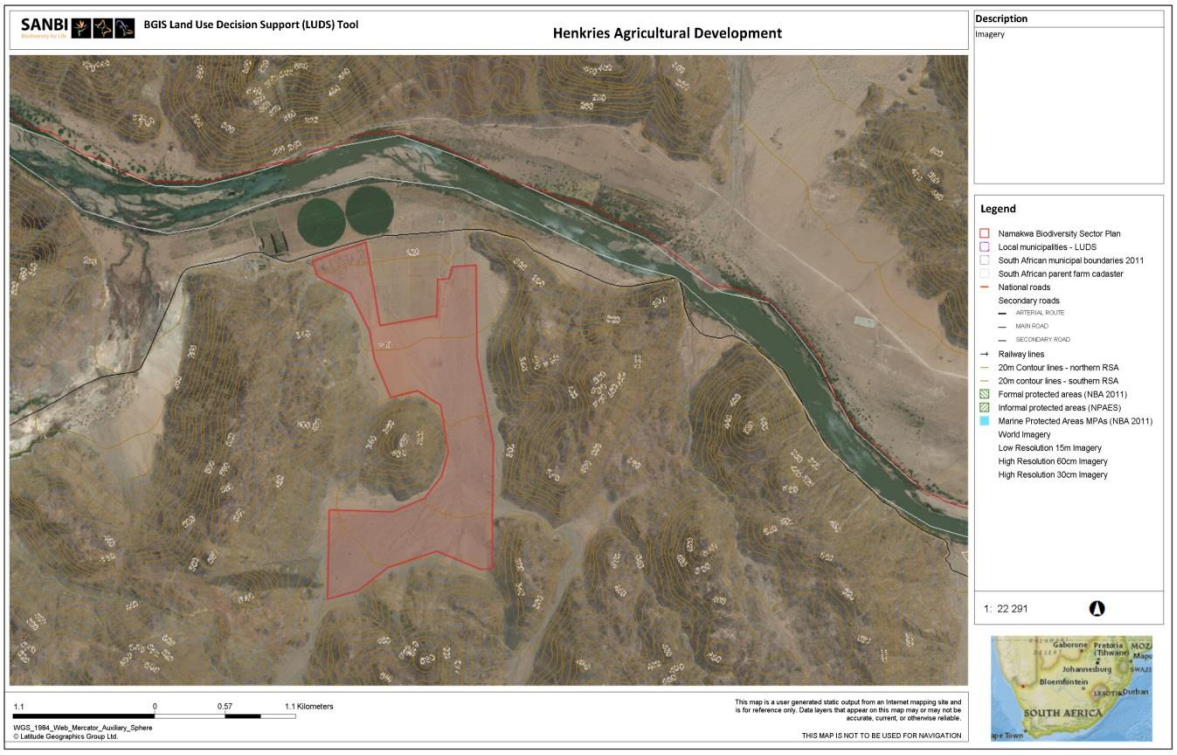
4. PROJECT DESCRIBTION

The New Growth Path (NGP) identified agriculture and its value chain as a catalyst for radical socio-economic transformation in the Northern Cape and focus on job creation and decent work towards the year 2020. The vision of the National Development Plan (NDP) is to create close to 1 million jobs in Agriculture and to reduce unemployment through:

- Expanded irrigated agriculture (by at least 500 000 ha).
- Revitalization of underutilized land in communal areas.
- Pick and support commercial sectors with highest potential for growth.
- To support job creation in the upstream and downstream industries.
- To find creative combinations between opportunities.

The Northern Cape Department of Agriculture, Land Reform and Rural Development identified Henkries as one of the areas within the Namakwa district where there is high quality arable land available (and water licenses from the Orange River) for the economic development of local communities. The proposed Henkries development will form part of the Orange River Emerging Farmer Settlement and Development Program which centres on economic growth, the development of rural communities and economic empowerment through the development of irrigation land into intensive agricultural production units in the Northern Cape.

Figure 1: The proposed development area (Red) near Henkries, just south of the Orange River (and existing agricultural land)



The scope of the Henkries project will be to develop approximately 130-150 ha of high potential arable land near Henkries. This development is designed to act as catalyst for the development of a further 3 000 ha of arable land which is located in eleven distinct areas of the Namaqualand District. The basket of products to be

produced varies from cash crops such as lucerne and grains, but the bulk of the development is aimed at high value crops with export potential in order to secure significant growth on the required investment. These products will be marketed through a central distribution center and processing facility earmarked to be developed in the Springbok Industrial Zone. The proposed development will also include the establishment of two reservoirs (262 m^3 and 21 120 m^3) and an extraction point at the existing Henkries Pump Station.

4.1 METHODS

Henkries lies in a semi-arid region with very low rainfall and very low rainfall incidence. There is thus very little seasonal variation in plant species composition. Seasonal variation depends on rainfall. In addition the vegetation does not support significant numbers of geophytes. Timing of the site visit is thus of less importance than for many other vegetation types.

Figure 2: Google image showing the routes walked during the site visit

Desktop studies were conducted, coupled by a physical site visit (3 September 2015). The timing of the site visit was reasonable in that essentially all perennial plants were identifiable and although the possibility remains that a few species may have been missed, the author is confident that a fairly good understanding of the vegetation and its status was obtained. The survey was conducted by walking through the site(s) and examining, marking and photographing any area of interest. Confidence in the findings is high.

During the site visit the author endeavoured to identify and locate all significant biodiversity features, including rivers, streams or wetlands, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

5. DESCRIPTION OF ENVIRONMENT

The aim of this description is to put the study area in perspective with regards to all probable significant biodiversity features which might be encountered within the study area. The study area has been taken as the proposed site and its immediate surroundings. During the desktop study significant biodiversity features associated with the larger surroundings was identified, and were taken into account. The desktop portion of the study also informs as to the biodiversity status as classified in the National Spatial Biodiversity Assessment (2004) as well as in the recent National list of ecosystems that are threatened and in need of protection (GN 1002, December 2011), promulgated in terms of the National Environmental Management Biodiversity Act (NEM: BA), Act 10 of 2004. It also aims to take Municipal Environmental Management Frameworks (EMF's) and Municipal Critical Biodiversity Areas (CBA's) into account where applicable.

5.1 LOCATION & LAYOUT

Henkries is a small settlement on the banks of the Orange River on the border with Namibia, about 90 km north-north-east of Springbok. The settlement is located within the Nama Khoi Local Municipality (Namakwa District Municipality) of the Northern Cape Province. The Namakwa District is the largest and least populous district in South Africa.

Figure 3: General location of Henkries within South Africa

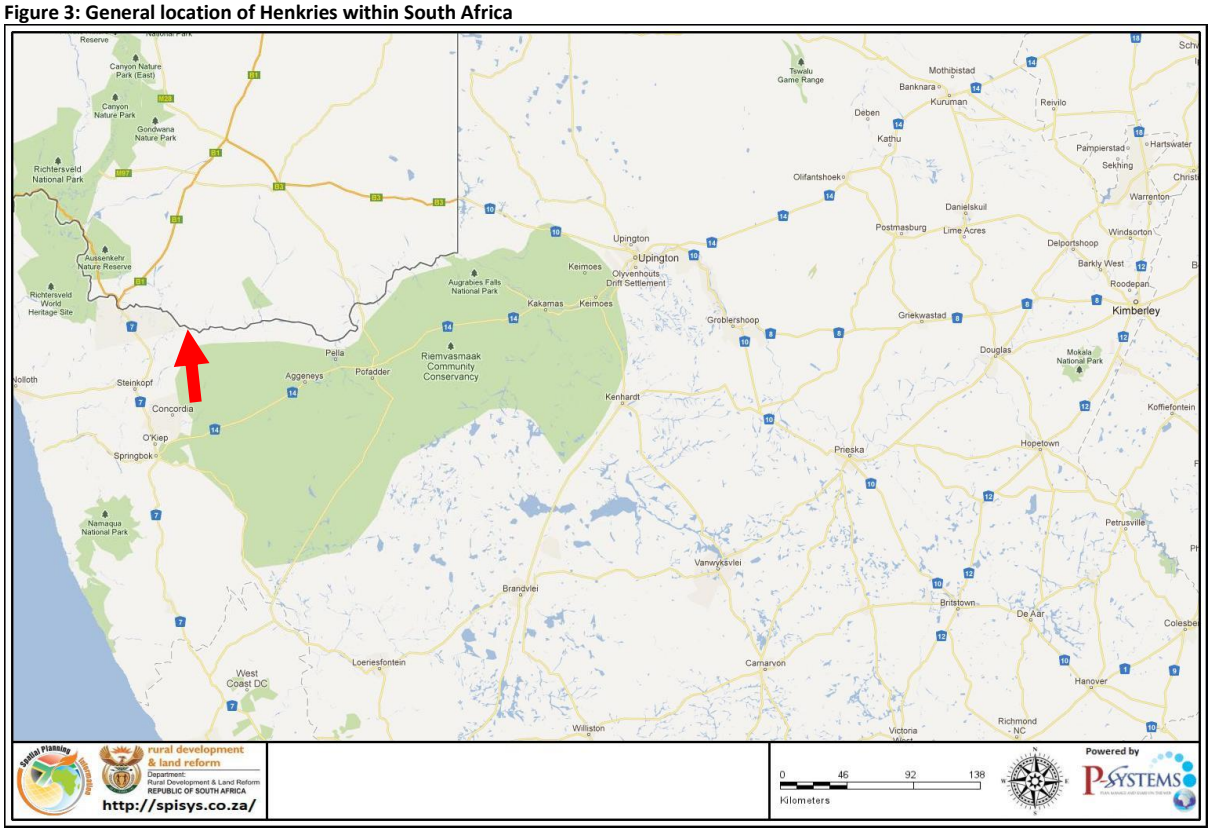


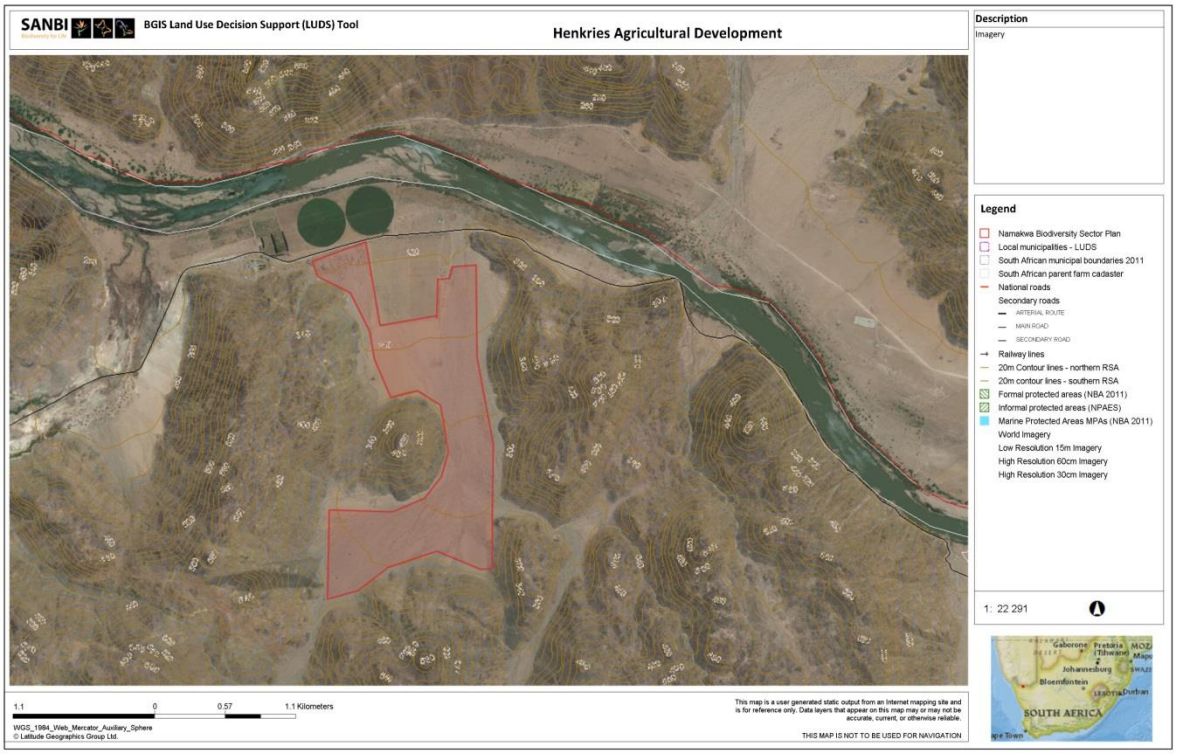
Table 1: GPS coordinates for the proposed Henkries Agri-Megapark and reservoirs

DESCRIPTION	FARM NAME	LATITUDE AND LONGITUDE	ALTITUDE
Agri-Megapark midpoint	Rem Farm Steinkopft 22, Springbok	S28 54 41.2 E18 09 10.8	261 m
Agri-Megapark mid-north	Rem Farm Steinkopft 22, Springbok	S28 54 10.3 E18 09 10.0	238 m
Agri-Megapark mid-south	Rem Farm Steinkopft 22, Springbok	S28 55 01.6 E18 08 53.0	285 m
Small Reservoir (Phase 1)	Rem Farm Steinkopft 22, Springbok	S28 54 10.3 E18 09 10.0	238 m
Large Reservoir (Phase 2)	Rem Farm Steinkopft 22, Springbok	S28 54 41.2 E18 09 10.8	261 m

5.2 TOPOGRAPHY

The proposed agri-megapark site is located within the Orange River valley, between Henkries and Goodhouse. At this point the Orange River valley opens up slightly to the south and north east. The Orange River being hemmed in by rocky mountain outcrops for the most part in this area (Figure 4). The proposed new development will be located within a sheet washed valley floor that opens up to the south of the Orange River, near Henkries (Figure 4).

Figure 4: Image showing the proposed development located within a small valley near Henkries



The alluvial floodplains next to the river have already been developed into agricultural land and small holdings. The valley ranges in width from less than 500 m to just over 2 km wide in places. In places, the area is very rocky and possesses a "broken" topography. On the pediments, Black Thorn (*Acacia mellifera)*, *Rhigozum trichotomum*, Shepherd's Tree (*Boscia albitrunca)* and Stink Shepherd's Tree (*B. foetida)* are common trees and shrubs, while Silky Bushman Grass (*Stipagrostis uniplumis)* can dominate the plains, especially after good summer rains. There are abundant thickets along the banks of the Orange River itself. However, the riparian vegetation (the zone of vegetation along the river banks) has been notably disturbed and replaced by invasive

alien species, most commonly Mesquite *(Prosopis glandulosa)*, with *Nicotiana glauca* (Wild tobacco) and *Ricinus communis* (Castor-oil plant) also in evidence.

The valley floor proposed for the development of the Agri-megapark, ranges in elevation from approximately 300 m in the south, sloping down towards the Orange River valley bottom at about 224 m. The surrounding kopjes can reach anything from 300 – 500 m in height.

5.3 CLIMATE

All regions with a rainfall of less than 400 mm per year are regarded as arid. The Henkries area falls within the desert biome or **hyperarid region** of fringing the western South African shoreline, Southern Angola and Namibia. The desert biome is characterised by ecological extremes and of all the biomes in SA it has the lowest amount of and the variability in rainfall. Henkries normally receives about 82.5 mm of rain per year, with most rainfall occurring mainly during autumn. Table 2, below, shows the average rainfall values for Henkries as measured between January 2000 and December 2008 (www.weatheronline.co.uk). It receives the lowest rainfall (0.3 mm) in November and the highest (26.4 mm) in April.

Table 2: Average precipitation for Henkries mond as measured from January 2000 to December 2008

Jan	Feb	Mar	Apr	May	Jun	
8.4	**9.8**	**11.6**	**26.4**	**4.8**	**5.4**	[mm]
83	90	90	94	87	92	Data availability[%]

Jul	Aug	Sep	Oct	Nov	Dec	
2.5	**7.1**	**0.9**	**4.2**	**0.3**	**1.0**	[mm]
91	89	93	89	85	87	Data availability[%]
Averaged Value (January 2000 - December 2008) : **82.5 mm**						

Table 3 shows monthly average temperatures per day as measured between January 2000 and December 2008. It shows that the average midday temperatures for Henkries can range between 14°C in June/July to 28.9°C in February. The region is the coldest during June - August when the temperatures can drop to 6°C on average during the night and the hottest during December to February when the temperatures can climb to 37.8°C on average during the day (www.weatheronline.co.zuk).

Table 3: Average temperatures per day for Henkries as measured from January 2000 to December 2008

Jan	Feb	Mar	Apr	May	Jun	
28.7	**28.9**	**27.2**	**23.0**	**18.3**	**14.0**	[°C]
66	77	72	78	72	79	Data availability[%]

Jul	Aug	Sep	Oct	Nov	Dec	
14.0	**14.8**	**18.9**	**22.5**	**25.7**	**26.9**	[°C]
79	75	80	70	71	70	Data availability[%]
Averaged Value (January 2000 - December 2008) : **21.9 °C**						

5.4 GEOLOGY & SOILS

According to Mucina and Rutherford (2006) and the SANBI Biodiversity Geographical Information System, the geology and soils of the alluvial soils next to the river are mostly recent alluvial deposits of the Orange River supporting soil forms such as Dundee and Oakleaf. The river cuts through a great variety of Precambrian metamorphic rocks (la land type). As it name suggests the flood plains are subject to floods, especially in summer, caused by high precipitation on the Highveld. Along the upper slopes the geology and soils are described by Mucina and Rutherford (2006) as follows: towards the east mainly leucocratic biotite gneiss and quartz-feldspar gneiss of the Stalhoek Complex and lesser amounts of leucocratic biotite gneiss are, with intercalations of calc-silicate rocks, mafic gneiss, and a quartzite-schist association of the Hom Subgroup, Bushmanland Group. In the west the area consists of granodiorite, adamellite, leucogranite, tonalite and diorite of the Vioolsdrif Suite and intermediate and acid volcanics of the Haib Subgroup of the Orange River Group (all of the above of Mokolian age). Very rocky substrate, with little or no soils. Land type lc. Soils are described as soils with minimal development, usually shallow on hard and weathered rock, with or without intermitted diverse soils. Lime generally present in part or most of the area.

A detailed soil study was done by Digital Soils Africa (3 December 2014) in order to determine the suitability of the soils for dates and grapes production under irrigation. The soils are described by DSA as follows:

- The site has a high potential for production of grapes and dates under irrigation.
- Soils don't have thick grey layers within 400 mm and have a low clay content allowing high infiltration and drainage.
- Soils are deep (3000 mm+) and therefore when waterlogged, drainage is easily installed and chemical properties can be easily rectified.
- The Dundee soil form covers the whole area.
- The orthic A horizon is poorly expressed.
- The only morphological property is stratification which varies in expression and thickness.
- The texture is sand with 37 % gravel fragments on average. The gravel is of a variety of sizes.

No special soils or geology features (e.g. quartz patches or broken veld), which could support special botanical features, were observed during the site visit (or are expected).

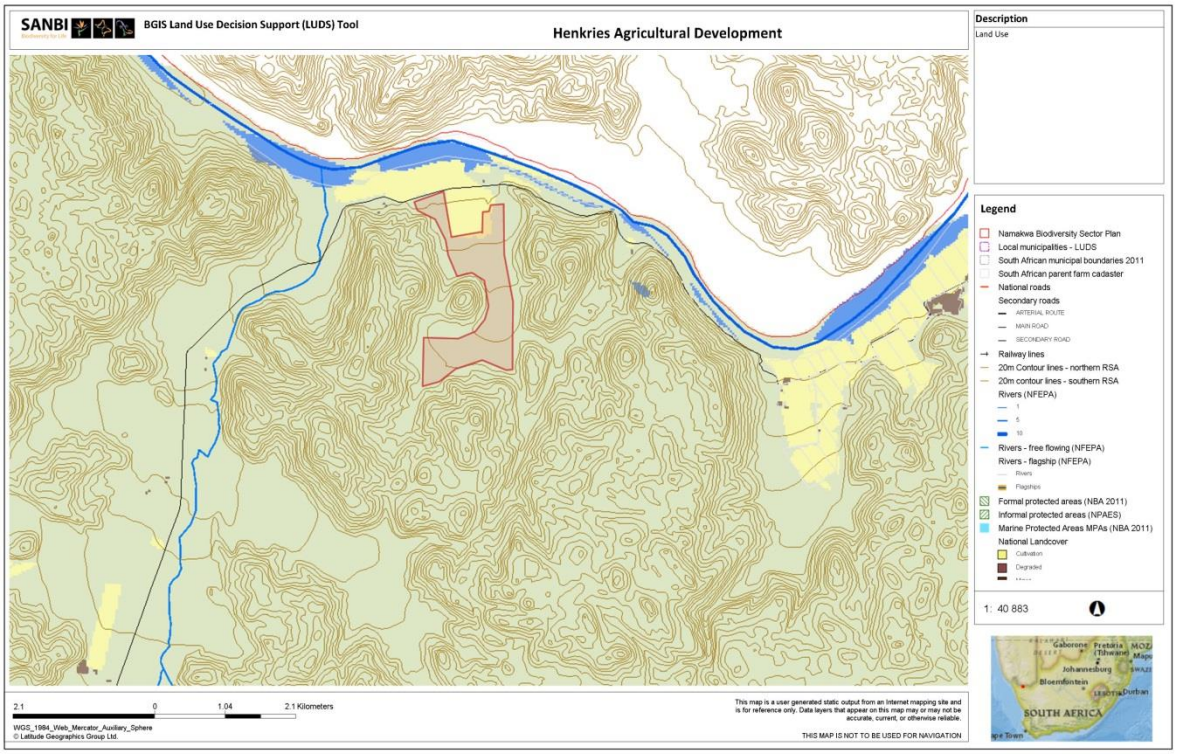
5.5 LANDUSE AND COVER

Henkries lies in a hyperarid region and fresh water is a scarce resource in the district. It has implications for the types of agricultural activities that can take place, in that the most appropriate crops and the most water-efficient irrigation technologies need to be promoted. The only sustainable source of good quality irrigation water is the Orange River. In terms of biodiversity the area is rich in natural flora which can be harnessed as a unique tourism attraction. The area has a hot and sunny climate with the highest solar radiation intensity in South Africa, making it appropriate for private and large-scale solar energy generation (Draft Henkries Mega-

Agripark Development Report, 2015). The Namaqualand's major land use is defined by livestock grazing and mining. Approximately 90% of the district's land surface is natural rangelands used for livestock grazing and the remaining 10% is a combination of mining, urban development, protected areas and crop agriculture (Todd et al. 2009; Bourne et al., 2012)

Henkries Farm is well known for its date production. Over and above the approximately 60 ha of dates for commercial markets, cash crops and vegetables are produced under pivot irrigation on approximately 25 ha. The primary objective of the existing agricultural development project at Henkries Farm centres on economic growth, job creation and economic empowerment, through the production of dates, dry grapes (raisins) and mango's under irrigation. The scope of this project is to upgrade the packaging facilities & housing complexes, ESKOM electricity system, current irrigation infrastructure, mechanization and to expand the production of dates and dry grapes (raisins) under irrigation. The Department of Agriculture, Land Reform and Rural Development took over management of Henkries Farm from CASIDRA on 1 June 2008.

Figure 5: BGIS Land use map showing Henkries and surroundings and the proposed development in remaining natural veld



The proposed site is located in a sheet washed plains between the rocky mountain outcrops. There are no permanent streams or wetlands on the proposed site, but run-off drainage lines have established in order to drain the flat land during thunderstorm events. The main biodiversity features of the site are (Figure 5):

- The site still supports Eastern Gariep Rocky Desert vegetation, the natural vegetation type expected to be found.
- Protected plant species encountered.
- Small seasonal drainage lines were observed, and must also be addressed.

5.6 WETLANDS AND WATERCOURSES

Rivers maintain unique biotic resources and provide critical water supplies to people. South Africa's limited supplies of fresh water and irreplaceable biodiversity are very vulnerable to human mismanagement. Multiple environmental stressors, such as agricultural runoff, pollution and invasive species, threaten rivers that serve the world's population. River corridors are important channels for plant and animal species movement, because they link different valleys and mountain ranges. They are also important as a source of water for human use. Vegetation on riverbanks needs to be maintained in order for rivers themselves to remain healthy, thus the focus is not just on rivers themselves but on riverine corridors.

The proposed agricultural development will be located on an open sheet washed valley floor with a very low gradient within a hyperarid region (average rainfall of 82.5 mm per year). Much of this rainfall is experienced in thunder storms resulting in sudden flash floods, draining higher lying kopjes into the open (wider) sheet washed valley floor, typically resulting in deposition of sediment giving rise to an alluvial fan being formed within the valley floor (Ollia *et al*, 2013). However, rainfall can at best be described as episodic or sporadic, and water will only flow for very short periods of time (Non-perennial), with intervals that can vary greatly. As a result the soils will rarely be inundated for longer than a couple of days at a time (if so long).

Photo 1: A photo of the terrain (South western portion) showing one of the better established drainage lines

The alluvial fan that was formed within the sheet washed valley floor proposed for the agricultural development supports a number of small intermittent channels (Ollia *et al*, 2013). A few of these channels are

relatively well defined, and may even sometimes be delineated by grassy vegetation (Photo 1). But because of its non-perennial and very short lived function these channels can at best be described as drainage lines in a very arid region. Furthermore, they are very limited in size and as such are not regarded as of significant ecological importance. It is, however, important that agricultural development will have to design erosion drainage and erosion control measures in order to provide for drainage of flash floods (thunder storms).

5.7 BROAD SCALE VEGETATION TYPES EXPECTED

In accordance with the 2006 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) two broad vegetation types are expected in the vicinity of the proposed development, namely ***Lower Gariep Alluvial Vegetation*** along the Orange river alluvial plain (Blue in Figure 6), and ***Eastern Gariep Rocky Desert*** inland of the alluvial plain. Only ***Eastern Gariep Rocky Desert*** is expected to be impacted by the proposed project (refer to Figure 6). However, **Eastern Gariep Plains Desert** is normally expected in the sheet washed plains between the rocky outcrops covered with Eastern Gariep Rocky Desert vegetation.

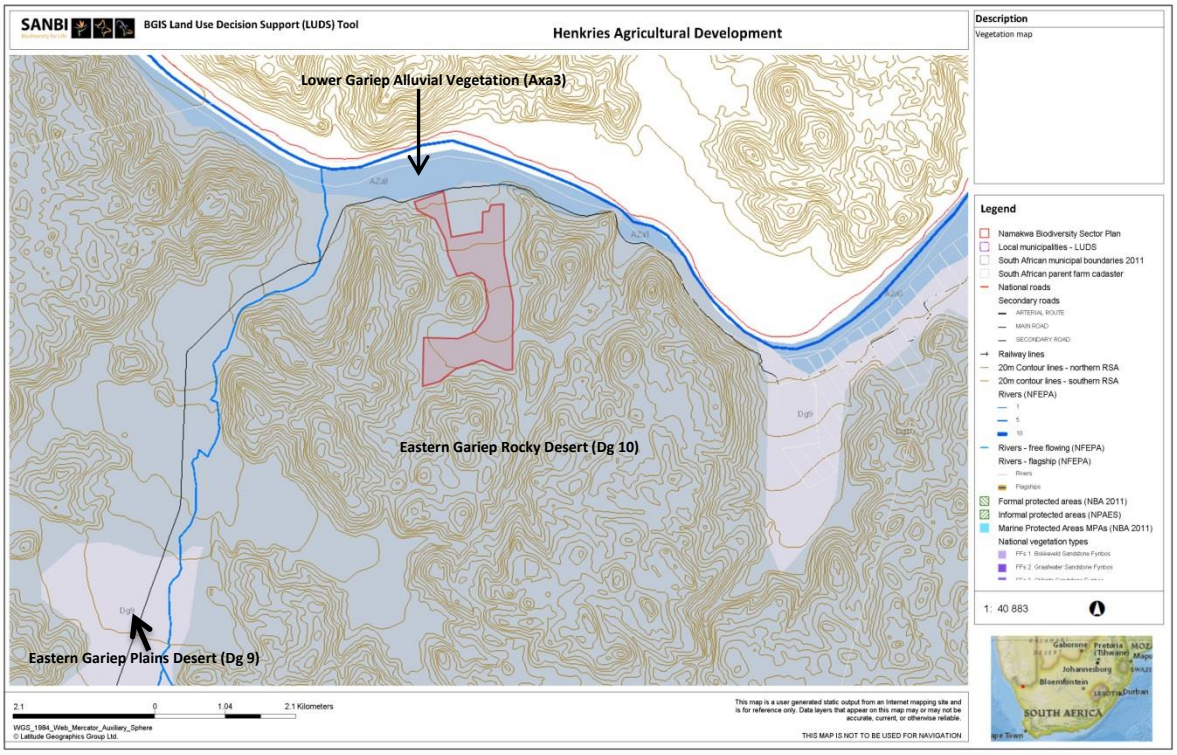
According to the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011) these vegetation types are currently classified as follows

Table 4: Vegetation status according to the 2004 & 2011 National Spatial Biodiversity Assessment

VEGETATION TYPE	NATIONAL STATUS 2011	REMAINING (2004)	CONSERVATION TARGET	FORMALLY CONSERVED
Lower Gariep Alluvial Vegetation	Endangered	50.3%	31%	5.8%
Eastern Gariep Rocky Desert	Least Threatened	99.7%	34%	-
Eastern Gariep Plains Desert	Least Threatened	Very little intact examples remains	34%	-

However, it is important to note that even though Eastern Gariep Rocky Desert (and Eastern Gariep Plains Desert), is classified as least threatened, it falls within the South African Desert Biome, in this case fringing on the Namibian desert. The Desert Biome is a hyperarid region of great age and one with extraordinary high diversity of organisms (including many endemics) and adaptions. It includes both winter- and summer rainfall areas, making it one of the most interesting hyperarid regions of the world. Compared with other desert regions, plant species richness is very high (especially the Richtersveld) and does not differ much from that of the Succulent Karoo (Mucina & Rutherford, 2006). However, not all parts of this biome are equally rich in species diversity. Plant species richness of the western Gariep Lowland Desert vegetation unit, is thought to be less rich than that of for example the Richtersveld and is described by Mucina & Rutherford (2006) as moderate.

Figure 6: Vegetation map of SA, Lesotho and Swaziland (2006)



5.7.1 Eastern Gariep Rocky Desert

The vegetation type is described as occurring on hills and mountains (up to 650 m of relative altitude from their base), mostly with bare rock outcrops and covered with very sparse shrubby vegetation in crevices, usually separated by broad sheet-wash plains (Eastern Gariep Plains Desert).

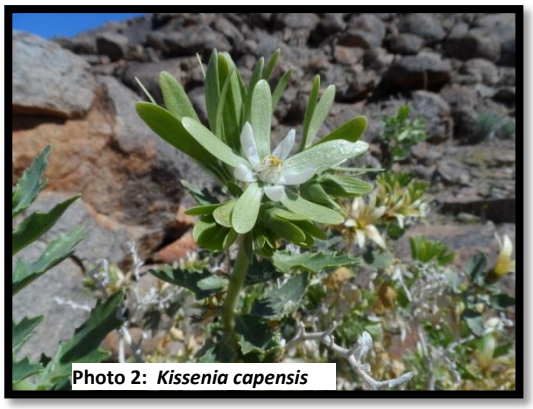


Photo 2: *Kissenia capensis*

Important Taxa (""Mainly western part, 'Mainly eastern part) Succulent Tree: Aloe dichotoma. Small Trees: *Acacia mellifera, Boscia albitrunca, B. foetida, Ehretia rigida, Euclea pseudebenus*, *Maerua gilgii*, *Pappea capensis*. Stem-& Leaf-succulent Shrubs: *Brownanthus pseudoschlichtianus*, *Ceraria fruticulosa, Psilocaulon subnodosum, Ruschia barnardii*. Stem- succulent Shrubs: *Ceraria namaquensis, Commiphora capensis, C cervifolia, C. gracilifrondosa', C namaensis, Euphorbia avasmontana, E. friedrichiae, E. gariepina, E. gregaria, E. guerichiana, E. virosa.* Leaf- succulent Shrubs: *Aloe dabenorisana, A. gariepensis, Mesembryanthemum inachabense, Prenia tetragona, Trianthema parvifolia, Tylecodon rubrovenosus, Zygophyllum decumbens, Z microcarpurn, Z. rigidum.* Other Shrubs: *Adenolobus gariepensis, Antherothamnus pearsonii, Aptosimum tragacanthoides, Barleria lancifolia', B. rigida, Cadaba aphylla, Calicorema capitata, Diospyros acocksii, Dyerophytum africanum, Eriocephalus scariosus, Hermannia stricta, Justicia orchioides, Monechma mollissimum, Petalidium setosum, Rhigozum obovatum, Rhus populifolia, Sisyndite spartea.* Graminoids: *Enneapogon scaber, Schmidtia kalahariensis, Stipagrostis anomala, S. ciliata, S. obtusa*. Perennial

Herbs: *Abutilon pycnodon, Chascanum garipense, Codon royenii, Rogeria longiflora, Tribulus cristatus.* Geophytic Herb: *Bowiea gariepensis*. Succulent Herb: *Mesembryanthemum guerichianum*. Annual Herbs: *Cleome angustifolia* subsp. *Diamdra* and *C. foliosa* var. *lutea*.

Endemic Taxa Small Tree: *Ozoroa namaquensis*. Leaf-succulent Dwarf Shrub: *Tylecodon sulphureus*.

5.7.2 Eastern Gariep Plains Desert

The vegetation type is described as occurring on sloping plains, sharply contrasting with the surrounding rocky hills and mountains. Typical wash vegetation in the breaks between the mountains to the Orange River. Grassland dominated by 'white grasses', some spinescent (*Stipagrostis* species), on much of the flats with additional shrubs and herbs in the drainage lines or on more gravelly or loamy soil next to the mountains.

According to Rutherford and Mucina (2004), important taxa include the following: Small tree: *Parkinsonia africana*. Stem- & Leaf-succulent Shrubs: *Brownanthus pseudoschlichtianus*, *Psilocaulon subnodosum*. Stem-succulent Shrub: *Euphorbia gregaria*. Leaf-succulent Shrub: *Zygophyllum microcarpum*. Other Shrubs: *Sisyndite spartea*, *Calicorema capitata*, *Galllonia crocyllis*, *Hermbstaedtia glauca*, *Monechma spartioides*, *Petalidium setosum*. Graminoids: *Stipagrostis brevifolia*, *S. ciliata*, *Schmidtia kalahariensis*, *Stipagrostis obtusa*. Perennial Herbs: *Codon royenii*, *Rogeria longiflora*. Succulent Herb: *Mesembryanthemum guerichianum*.

5.8 VEGETATION ENCOUNTERED

Photo 3: *Ornithoglossum vulgare*

The proposed development will involve most of the sleet washed plains area locked in between the rocky outcrops of the terrain (Refer to Figure 4). Please note that portions of this valley (next to the Henkries road) have already been developed. According the vegetation map of South Africa (Mucina & Rutherford, 2006) the proposed Agri-Megapark and reservoirs will be located within a vegetation type mapped as Eastern Gariep Rocky Desert vegetation (Refer to Figure 6). However, while Eastern Gariep Rocky Desert vegetation is expected on the rocky outcrops and the foothill of the rocky outcrops, Eastern Gariep Plains Desert vegetation is normally expected in the sheet washed plains which separates the rocky outcrops. The vegetation encountered shows little of the white grass dominated vegetation type normally expected with plains desert, but rather showed shrubby vegetation dominated by *Petalidium*, *Sisyndite*, *Psilocaulon*, *Monechma* and sometimes open plains. The grassy component was poorly represented and very likely reduced as a result of past and present grazing practices (sheep and goat farmers), coupled with low and infrequent rainfall events.

Two vegetation communities was encountered namely a *Psilocaulon subnodosum – Monechma mollissimum* low shrub community, which covered most of the open plains area, while areas associated with drainage channels where mostly associated with a *Stipagrostis namaquensis – Petalidium setosum* grassy community.

5.8.1 Psilocaulon subnodosum – Monechma mollissimum low shrub community

The *Psilocaulon subnodosum – Monechma mollissimum* low shrub community were encountered on the valley floor for most of the sheet washed terrain (Photo 4). The vegetation comprises a single layer of vegetation (reaching 0.5 m in height) dominated by the low succulent shrub, *Psilocaulon subnodosum,* with *Monechma mollissimum* and *Sisyndite spartea* also prominent. In combination with *Psilocaulon subnodosum, Monechma mollissimum* was sometimes more prominent while in other instances *Sisyndite spartea* may be more prominent, with *Monechma* less so.

Photo 4: *Psilocaulon subnodosum – Monechma mollissimum* community to the south west of the property

Within this community the small tree *Boscia albitrunca* was occasionally encountered (sometimes also associated with drainage channel vegetation). Other species encountered within this vegetation type were: *Acanthopsis carduifolia*, *Acanthopsis* cf. *disperma*, *Amellus nanus*, *Aptosimum spinescens*, *Cleome foliosa*, *Codon royenii*, *Forsskaolea candida*, *Helichrysum cerastioides*, *Hirpicium echinus*, *Maerua gilgii* (associated with drainage lines), *Monsonia parvifolia, Ornithoglossum vulgare, Petalidium setosum*, a *Ruschia* species, *Rogeria longiflora*, *Sisyndite spartea*, *Stipagrostis ciliata, Trianthema parvifolia, Tribulus zeyheri* and *Zygophyllum decumbens*.

5.8.2 Stipagrostis namaquensis – Petalidium setosum grassy community

The *Stipagrostis namaquensis – Petalidium setosum* community was associated with the drainage channels, which cut through the *Psilocaulon* dominated shrubland. The grass *Stipagrostis namaquensis* dominated this vegetation type with *Petalidium setosum* also very prominent (Photo 6).

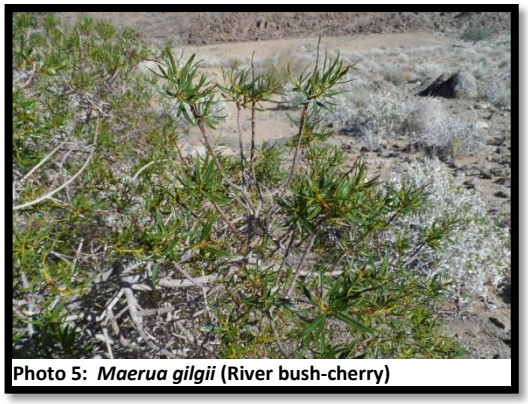


Photo 5: *Maerua gilgii* (River bush-cherry)

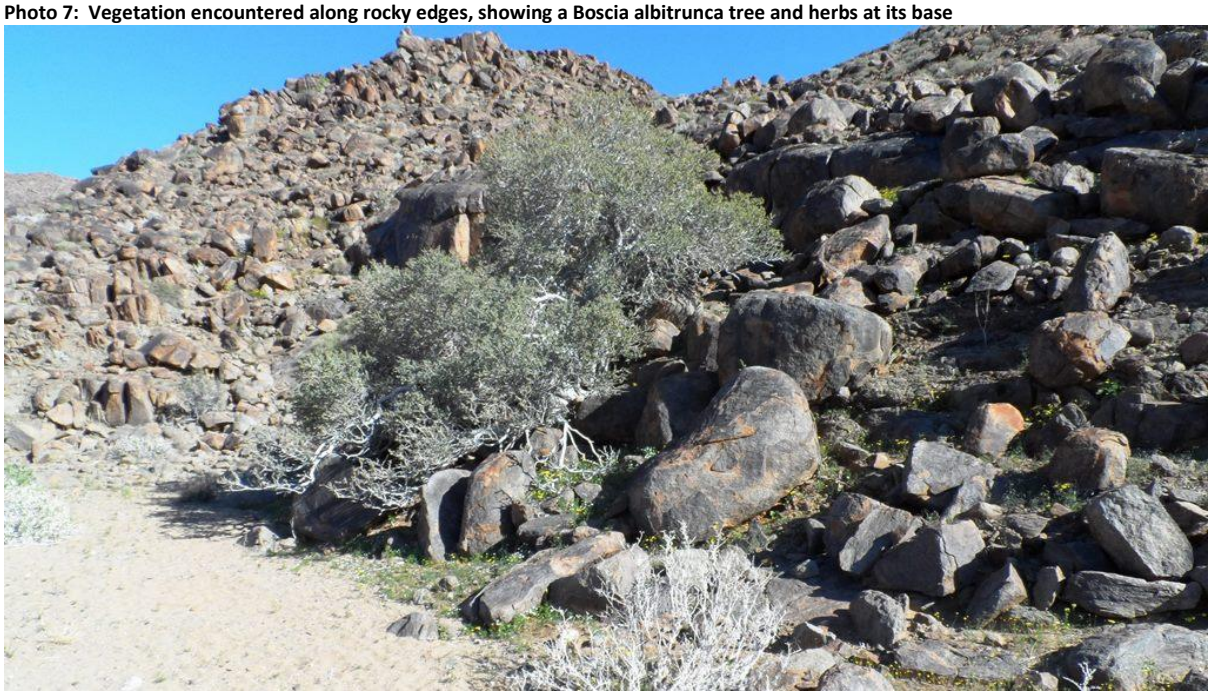
This was mostly also a mono-stratum community reaching approximately 0.7 m in height. However, shrubs and small trees like *Cadaba aphylla, Gaillonia crocyllis* and *Sisyndite spartea* can form a second layer reaching 1.5 m. Small trees like *Boscia albitrunca* and *Maerua gilgii* (small tree) were also occasionally encountered. Other species associated with this community include: *Aptosimum spinescens*, *Cleome foliosa*, *Didelta carnosa*, *Heliophila arenaria, Hemimeris montana, Hermannia stricta, Ornithoglossum vulgare, Mesembryanthemum guerichianum, Psilocaulon subnodosum, Prosopis* species*, Rogeria longiflora, Tetragonia* cf. *echinata, Trianthema parvifolia, Tribulus zeyheri* and *Zygophyllum decumbens*

Photo 6: Stipagrostis namaquensis – Petalidium setosum grassy community

5.8.3 Rocky outcrops

Apart from the plant communities above, the following plants were also encountered, but only in close association with the rocky outcrops (Photo 7), namely: *Dyerophytum africanum*, *Fagonia capensis, Jamesbrittenia glutinosa, Kissenia capensis, Searsia populifolia* and *Zygophyllum macrocarpon.*

Photo 7: Vegetation encountered along rocky edges, showing a Boscia albitrunca tree and herbs at its base



5.9 FLORA ENCOUNTERED

Please note that this study never intended to be full botanical assessment. However, a scan of significant species was done during the site visit, and even though the author does not claim that all species encountered were identified, all efforts were made to do just that.

Table 5: List of species encountered on the sites (excluding grass species)

SPECIES NAME	COMMON NAME	FAMILY	STATUS
Acanthopsis carduifolia		ACANTHACEAE	
Acanthopsis cf. disperma	Verneuk halfmensie	ACANTHACEAE	
Amellus nanus		ASTERACEAE	
Aptosimum spinescens	Doringviooltjie	SCROPHULARIACEAE	
Boscia albitrunca	Sheppard's tree	CAPPARACEAE	Protected in term of the **NFA** and all Boscia species protected in terms of Schedule 2 of NCNCA
Cadaba aphylla	Desert spray	CAPPARACEAE	
Cleome foliosa		CLEOMACEAE	
Codon royenii	Soetdoringbos	BORAGINACEAE	
Didelta carnosa	Perdebos	ASTERACEAE	
Dyerophytum africanum		PLUMBAGINACEAE	
Fagonia capensis		ZYGOPHYLLACEAE	
Forsskaolea candida	Pleisterbos	URTICACEAE	
Foveolina dichotoma	Gansogies	ASTERACEAE	
Helichrysum cerastioides		ASTERACEAE	
Heliophila arenaria	Blousporrie	BRASSICACEAE	
Hemimeris montana		SCROPHULARIACEAE	

SPECIES NAME	COMMON NAME	FAMILY	STATUS
Hermannia stricta	Desert rose	MALVACEAE	
Hirpicium echinus		ASTERACEAE	
Jamesbrittenia glutinosa		SCROPHULARIACEAE	All *Jamesbrittenia* protected in terms of Schedule 2 of NCNCA
Kissenia capensis		LOASACEAE	
Maerua gilgii	River bush cherry	CAPPARACEAE	
Mesembryanthemum guerichianum	Soutslaai	AIZOACEAE	All Aizoaceae protected in terms of the Schedule 2 of NCNCA
Monechma mollissimum		ACANTHACEAE	
Monsonia parvifolia		GERANIACEAE	
Ornithoglossum vulgare	Spinnekop blom	COLCHICACEAE	
Petalidium setosum	Namib petal-bush	ACANTHACEAE	
Prosopis grandulosa	Honey mesquite	FABACEAE	**Category 2 invader**
Psilocaulon subnodosum (Recently renamed to Mesembryanthemum subnodosum)		AIZOACEAE	All Aizoaceae protected in terms of the Schedule 2 of NCNCA
Rogeria longiflora		PEDALIACEAE	
Ruschia species		AIZOACEAE	All Aizoaceae protected in terms of the Schedule 2 of NCNCA
Searsia populifolia	Suurtaaibos	ANACARDIACEAE	
Sisyndite spartea	Desert broom	ZYGOPHYLLACEAE	
Stipagrostis ciliata	Langbeen-boesmangras	POACEAE	
Stipagrostis namaquensis		POACEAE	
Tetragonia cf. *echinata*	Misbredie	AIZOACEAE	All Aizoaceae protected in terms of the Schedule 2 of NCNCA
Trianthema parvifolia		AIZOACEAE	All Aizoaceae protected in terms of the Schedule 2 of NCNCA
Tribulus zeyheri	Duwweltjie	ZYGOPHYLLACEAE	
Zygophyllum decumbens		ZYGOPHYLLACEAE	
Zygophyllum macrocarpon		ZUGOPHYLLACEAE	
Zygophyllum microcarpum	Armoedsbossie, Ouooibos	ZYGOPHYLLACEAE	

5.10 THREATENED AND PROTECTED PLANT SPECIES

South Africa has become the first country to fully assess the status of its entire flora. Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of threats like, habitat loss (e.g. infrastructure development, urban expansion, crop cultivation and mines), invasive alien plant infestation (e.g. outcompeting indigenous plant species), habitat degradation (e.g. overgrazing, inappropriate fire management etc.), unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods). South

Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction, but may nonetheless be of high conservation importance. As a result a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Northern Cape, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "*Lists of critically endangered, endangered, vulnerable and protected species*" (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the "*List of protected tree species*" (GN 908 of 21 November 2014).
- Northern Cape Nature Conservation Act, Act of 2009, provides for the protection of "*specially protected species*" (Schedule 1), "*protected species*" (Schedule 2) and "*common indigenous species"* (Schedule 3).

5.10.1 NEM: BA Protected species

The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "Lists of critically endangered, endangered, vulnerable and protected species" (GN. R. 152 of 23 February 2007).

- No species protected in terms of NEM: BA was encountered.

5.10.2 National Forest Act, protected species

In terms of the National Forests Act of 1998 forest trees or protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the Department of Water Affairs and Forestry (or a delegated authority). Applications for such activities should be made to the responsible official in each province. Each application is evaluated on merit (including site visits) before a decision is taken whether or not to issue a licence (with or without conditions). Such decisions must be in line with national policy and guidelines.

Table 6 gives a list of species protected in terms of the NFA that might be encountered or are expected in this area.

Table 6: NFA protected tree species with a geographical distribution that may overlap the broader study area

SPECIES NAME	COMMON NAME	TREE NO.	DISTRIBUTION
Boscia albitrunca	Shepherds-tree Witgat/Matopie	122	Occurs in semi-desert and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils.
Euclea pseudebenus	Ebony quarry	598	Occurs in semi-desert and desert areas, usually along water courses and depressions.

Only two tree species were encountered on the site, namely *Boscia albitrunca* and *Maerua gilgii.* Both of these species are important in their own right (as any indigenous larger tree should be regarded in any semi-desert or desert area). Maerua gilgii is also endemic to this area and has a relative small distribution.

However, only the *Boscia albitrunca* is protected in terms of the NFA. Sixteen (16) individual *Boscia albitrunca* trees and two (2) *Maerua gilgii* trees were observed within or near to the footprint of the proposed development (Refer to Table 7). Of the sixteen *Boscia* trees, only 7 are directly within the proposed footprint. It should be possible to safe all trees on the edge or outside the footprint. Final layout designs should take the locations of these protected trees in consideration, aiming at minimising impact.

Table 7: List of trees encountered at the site with ones likely to be impacted highlighted

SPECIES NAME	COORDINATES	DESCRIPTION	SPECIES NAME	COORDINATES	DESCRIPTION
052 Boscia albitrunca	S28 54 55.4 E18 08 56.0	Mature tree at base of rocky outcrop.	**053 Boscia albitrunca**	S28 54 56.1 E18 08 39.9	Mature tree (3m) within footprint.
054 Maerua gilgii	S28 54 55.7 E18 08 38.2	Mature tree (3m) outside footprint.	**055 Boscia albitrunca**	S28 54 54.1 E18 08 36.0	Mature tree (3m) outside footprint.
056 Boscia albitrunca	S28 55 02.0 E18 08 44.3	Mature tree (2.5m) within footprint.	**057 Boscia albitrunca**	S28 55 12.0 E18 08 32.7	Mature tree (2m) within footprint.
058 Boscia albitrunca	S28 55 12.0 E18 08 32.7	Mature tree (4m) on edge of footprint.	**059 Boscia albitrunca**	S28 55 11.9 E18 08 32.6	Mature tree (4m) on edge of footprint.
060 Boscia albitrunca	S28 55 12.8 E18 08 31.0	Mature tree (2.5m) ouside footprint.	**061 Boscia albitrunca**	S28 55 12.8 E18 08 33.9	Mature tree (3m) within footprint.
062 Boscia albitrunca	S28 55 13.3 E18 08 34.7	Mature tree (2m) within footprint.	**063 Boscia albitrunca**	S28 55 14.2 E18 08 35.1	Mature tree (3m) within footprint.
064 Boscia albitrunca	S28 55 19.0 E18 08 32.0	Mature tree (3m) outside footprint.	**065 Boscia albitrunca**	S28 55 09.3 E18 08 56.8	Mature tree (2.5m) next to rocky outcrop within footprint.
066 Boscia albitrunca	S28 54 55.8 E18 09 17.0	Mature tree (2.5m) on edge of footprint.	**067 Maurea gilgii**	S28 54 55.4 E18 09 17.5	Mature tree (3m) outside of footprint.
068 Boscia albitrunca	S28 54 54.6 E18 09 14.3	Mature tree (3m) within footprint.	**069 Boscia albitrunca**	S28 54 34.7 E18 09 16.0	Mature tree (2m) on edge of footprint.

5.10.3 Northern Cape Nature Conservation Act, protected species

Seven plant species protected in terms of the NCNCA was encountered within the proposed footprint (Refer to Table 5). They are:

- ***Mesembryanthemum guerichianum***: Only two individuals were encountered, but this is a pioneer species and expected to be widespread (especially after disturbance).

- ***Psilocaulon subnodosum*** (Recently renamed to *Mesembryanthemum subnodosum*): A common species that was observed in great numbers on the site. Also considered a pioneer species.
- ***Ruschia*** species. Occasionally observed throughout the site.
- ***Tetragonia*** cf. ***echinata***: A pioneer species observed occasionally within the footprint.
- ***Trianthema parvifolia***: Occasionally observed throughout the site.
- ***Boscia albitrunca****:* Please refer to table 7 above.
- ***Jamesbrittenia glutinosa****:* Only single individuals observed at the foothills of the rocky area.

Apart from the *Boscia-*, *Ruschia-*, and *Jamesbrittenia* species all of the above can be considered pioneer species which is normally associated with disturbance. However, since all species of the Aizoaceae family is protected in terms of Schedule 2 of the NCNCA it means that even these common pioneer species are protected.

5.11 Fine-Scale mapping (CBA's)

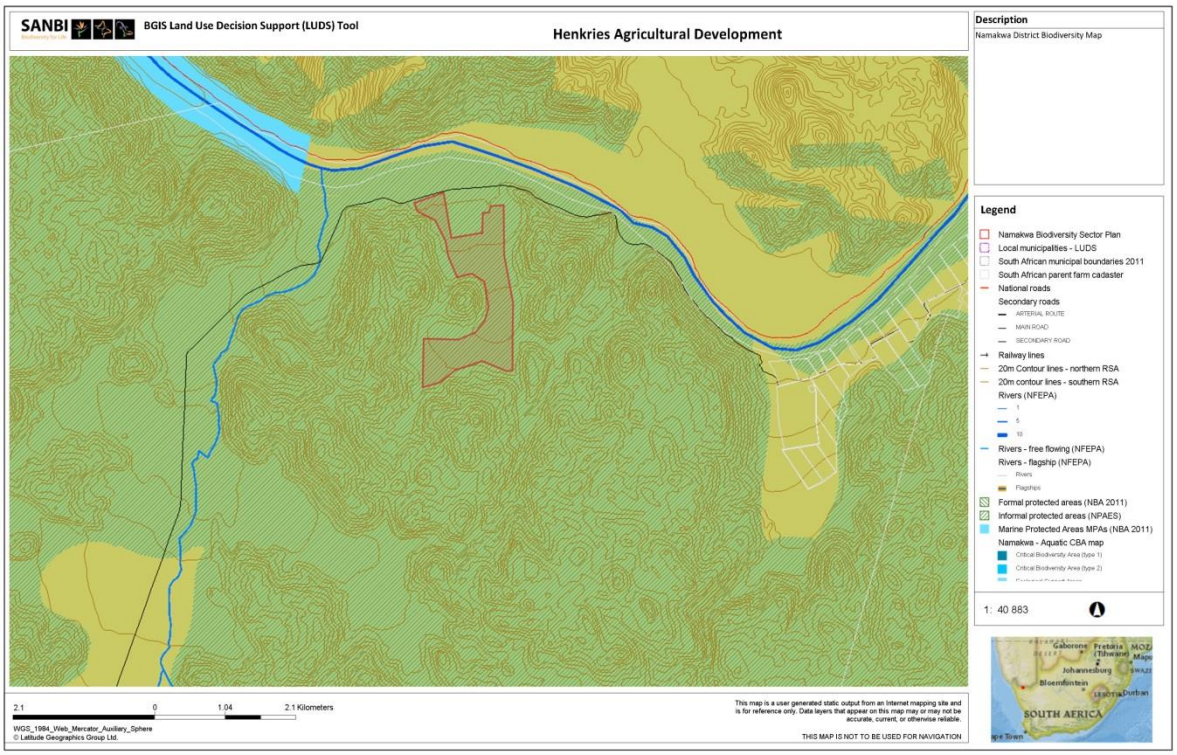
The Namakwa District Biodiversity Sector Plan (Desmet & Marsh, 2008) is intended to help guide land-use planning, environmental assessments and authorisations; and, natural resource management in order to promote sustainable development. It has been developed to further the awareness of the unique biodiversity in the area, the value this biodiversity represents to people and promote the management mechanisms that can ensure its protection and sustainable utilisation (Draft Namakwa District Biodiversity Sector Plan, Version 2).

The purpose of this document is to ensure that biodiversity information can be accessed and utilized by local municipalities within the Namakwa District Municipality (NDM) to inform land use planning and development as well as decision making processes within the NDM. To achieve this, this biodiversity profile information has been incorporated into the environmental planning section of the Spatial Development Frameworks (SDF's) for each of the six local municipalities in the district. This information includes maps and land use guidelines, which form part of the Integrated Development Plans (IDP's) of the municipalities. Thus, it is hoped that environmental considerations will be better taken into account within land use planning processes, especially within the identified Critical Biodiversity Areas (CBA) – which are areas that have been identified through conservation planning processes as irreplaceable, as well as key to the maintenance of ecosystem services.

In terms of the National Environment Management Act (NEMA) 107 of 1998, all organs of state are obligated to take biodiversity considerations into account and to ensure decisions are informed by the most up to date information. NEMA also states that, although the environment is a functional area of concurrent national and provincial legislative competence, all spheres of government and all organs of state must co-operate with, consult and support one another. Use of the CBA map and associated land use guidelines will support

municipalities and other sectors as they provide a common reference point of Critical Biodiversity Areas in the NDM for incorporation into multi-sectorial planning processes.

Figure 7: Namakwa District Biodiversity Sector plan indicating identified CBA area in and around Henkries



According to the CBA map for the Henkries area (Figure 7) it is clear that the proposed site and almost the whole of Henkries are located within proposed CBA 1. It must be noted that this map is not up to date, since all of the already developed areas (Refer to Figure 5) will then also fall within a CBA 1 area. Ideally the proposed site should have been placed outside of these CBA areas. In this case there is no land available at Henkries that will place a development of this size outside of the proposed CBA areas and still within easy access of irrigation.

5.12 Fauna and Avi-fauna

Although natural fauna and avi-fauna is likely to still be present, it is expected that it would be limited to smaller game, avi-fauna, insects and maybe some reptile's species, because of its proximity to existing agricultural land (and the fact that this property is grazed by at least two families). However, it is a known fact that many animal and bird species associate with larger indigenous trees such as *Boscia albitrunca* and the removal of mature trees will have an impact on such wildlife (even though very localised).

Mammals: The site falls within the distribution range of approximately 50 mammal species indicating moderate diversity. Human activity in the area is medium-high and it is highly unlikely that a fair representation of these mammals will be found on the property. The site is actively grazed by at least two families, which will also have a negative impact on the presence of even small game. The site visit also showed

very little evidence of the presence of game species (e.g. droppings, skeletons etc.) Also take into account that the Henkries area encompasses a very large range of natural veld and it is highly unlikely that the proposed development will have a significant impact on habitat or migration routes.
It is thus considered highly unlikely that the development will pose a significant impact on mammal species and as a result the impact is deemed negligible.

Reptiles: The site falls within the distribution range of approximately 30 reptile species, indicating low diversity. The open sandy plains, is not expected to house great numbers of reptile species (limited cover). The surrounding rocky outcrops, on the other hand, will have much more cover and habitat features favoured by a larger variety of reptile species. Species that are likely to be found in (or pass through) this type of habitat includes snakes, lizards and geckos. However, because of the lack of shelter, the aridity and subsequent lack of food coupled with existing human activity it is highly unlikely that large numbers of these species will be present on site at any one time. As a result, the impact on reptiles should be negligible.

Amphibians: The site falls within the distribution range of approximately 10 amphibian species. However, no suitable breeding places were observed on the proposed site and it is highly unlikely that the proposed development will have any significant impact on amphibian species. In addition, most amphibians require perennial water and will thus not be affected at all.

Avi-fauna: The site falls within the distribution range of approximately 200 bird species known from the broad area. The open sandy open plain is likely to provide a habitat for certain bird species as will the small number of full grown indigenous trees that were encountered on site, which will provide a micro-habitat more favourable for certain bird species. However, shelter, food and the number of trees and other edibles is a rarity and unlikely to attract bird species in great numbers.

The proposed development is not expected to have a significant impact on indigenous avi-fauna. The planting of vineyards and date palms, on the other hand, is likely to attract a number of fruit and insect eating bird species (and their predators).

5.13 INVASIVE ALIEN INFESTATION

A small number of *Prosopis* cf. *grandulosa* (a category 2 invader) were encountered scattered on almost all proposed sites. According to regulation 15 and 16 of CARA all category 2 plants has the proven potential of becoming invasive, but may have certain beneficial properties. The regulations makes provisions for category 2 plants to be retained in special areas demarcated for that purpose, but those occurring outside demarcated areas must be controlled.

In this case all *Prosopis* individuals should be removed from the footprint and its immediate vicinity wherever they are encountered.

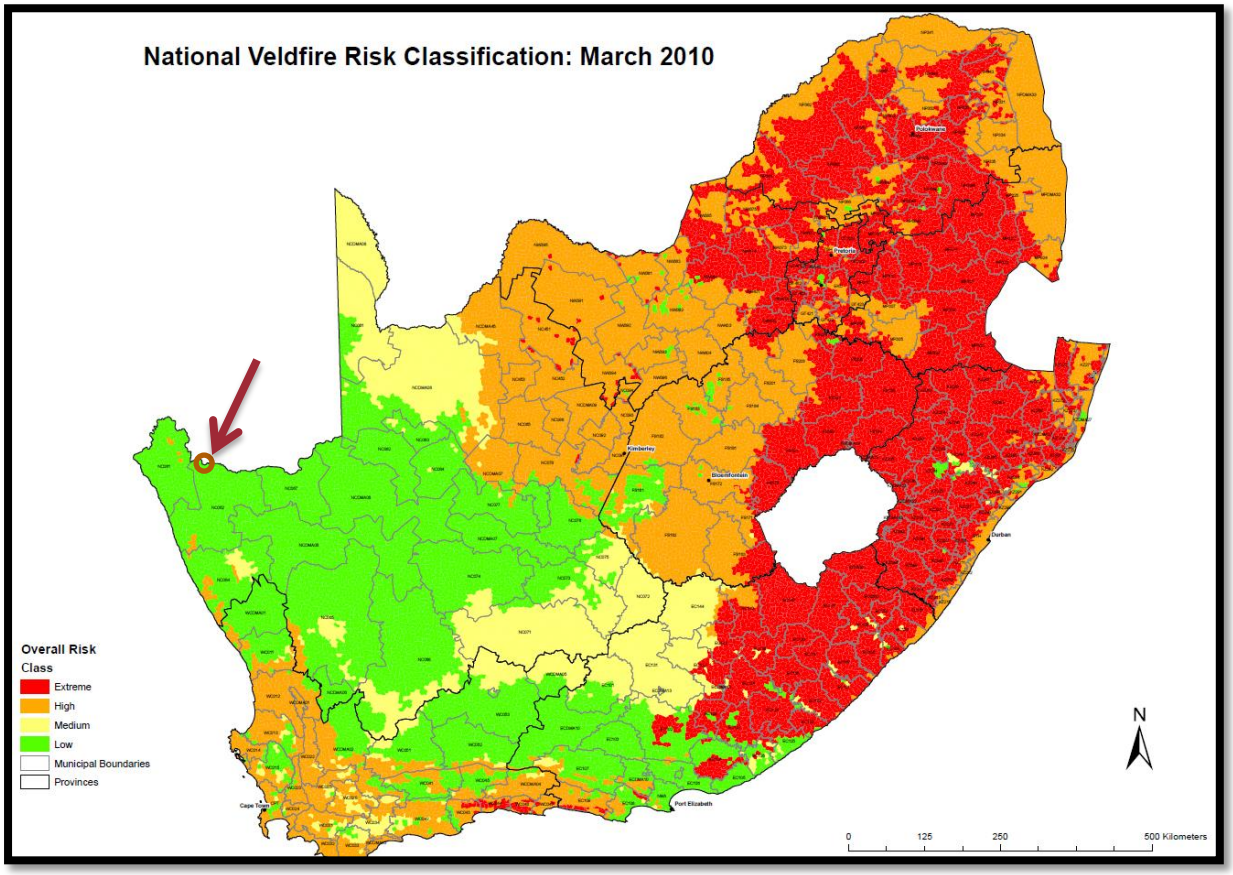
6. VELD FIRE RISK

Henkries is situated on the border between South Africa and Namibia and very arid desert type vegetation which is not prone to fire (Mucina & Rutherford, 2006).

The revised veldfire risk classification (Forsyth, 2010) in terms of the National Veld and Forest Fire Act 101 of 1998 was promulgated in March 2010. The purpose of the revised fire risk classification is to serve as a national framework for implementing the National Veld and Forest Fire Act, and to provide a basis for setting priorities for veldfire management interventions such as the promotion of and support to Fire Protection Associations. In the fire-ecology types and municipalities with High to Extreme fire risk, comprehensive risk management strategies are needed.

Henkries is situated in an area supporting desert vegetation, which has been classified with a **low fire risk classification**. Although, the fire risk is low it is still important that during construction and operation the site must adhere to all the requirements of the local Fire Protection Association (FPA) if applicable, or must adhere to responsible fire prevention and control measures.

Figure 8: South African National Veldfire Risk Classification (March 2010)



7. BIODIVERSITY ASSESSMENT

Biological diversity, or biodiversity, refers to the variety of life on Earth. As defined by the United Nations Convention on Biological Diversity, it includes diversity of ecosystems, species and genes, and the ecological processes that support them. Natural diversity in ecosystems provides essential economic benefits and services to human society—such as food, clothing, shelter, fuel and medicines—as well as ecological, recreational, cultural and aesthetic values, and thus plays an important role in sustainable development. Biodiversity is under threat in many areas of the world. Concern about global biodiversity loss has emerged as a prominent and widespread public issue. The objective of this study was to evaluate the biodiversity of the study area in order to identify significant environmental features which should be avoided during development activities and or to evaluate short and long term impact and possible mitigation actions in context of the proposed development.

As such the report aim to evaluate the biological diversity of the area using the Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al*., 2005), with emphasis on:

- Significant ecosystems
    - Threatened or protected ecosystems
    - Special habitats
    - Corridors and or conservancy networks
- Significant species
    - Threatened or endangered species
    - Protected species

7.1 SIGNIFICANCE RATING SCALE

Table 8 gives the categories used for significance rating within this report. It is adapted from categories discussed within the Impact Significance – Integrated Environmental Management Information Series 5 as published by the Department of Environmental Affairs and Tourism (DEAT, 2002). The objective being to be able to classify environmental impacts associated with the proposed project as negative or positive impacts and to evaluate or determine its potential significance.

Table 8: Categories for rating significance, adapted from DEAT, 2002

RATING	DESCRIPTION
Negligible	An impact barely noticeable in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no mitigation is required. These impacts will result in either positive or negative short term effects on the social and/or natural environment.
Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural and economic activities of communities can continue unchanged. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment within site boundaries.

RATING	DESCRIPTION
Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible. Social, cultural and economic activities of communities are changed, but can be continued (albeit in a different form). Modification of the project design or alternative action may be required. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort. These impacts will usually result in either a positive or negative medium to long-term effect on the social and/or natural environment, beyond site boundary within local area.
High	An impact of high order within the bounds of impacts that could occur. In the case of adverse impacts, mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. In the case of beneficial impacts, the impact is of a substantial order within the bounds of impacts that could occur. A serious impact, if not mitigated, may prevent the implementation of the project (if it is a negative impact). These impacts would be considered by society as constituting a major and usually a long-term change to the (natural &/or social) environment and result in severe effects or beneficial effects, beyond site boundaries, regional or widespread.
Very High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. In the case of beneficial impacts, the impact is of a substantial order within the bounds of impacts that could occur. A very serious impact which, if negative, may be sufficient by itself to prevent implementation of the project. The impact will result in permanent change. Very often these impacts are un-mitigatable and usually result in very severe effects, or very beneficial effects, beyond site boundaries, national or international.

7.2 IMPACT SIGNIFICANCE ASSESSMENT

Significance as a concept is at the core of impact identification, prediction, evaluation and decision-making in the environmental impact assessment (EIA) processes. The main purpose of which is to decide whether a project is likely to cause significant negative environmental impacts and to what end negative impacts can be negated or mitigated. Despite this, the concept remains largely undefined. A variety of definitions and explanations of the concept of significance exists. Currently there is no international consensus among practitioners on an agreed approach for assessing the significance of impacts. This, however, is not necessarily a weakness, but means that the concept of significance can be adapted for different political, social and cultural contexts (DEAT, 2002).

The table underneath list biodiversity aspects that may be impacted by the proposed development, with a short discussion on the criteria used in order to determine a significance rating for each aspect.

Table 9: Evaluation of potential impacts

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING	
Potential impacts on biophysical environment			
Geology & soils (Refer Par. 5.4)	A detailed soil study was performed by Digital Soils Africa (3 December 2014). According to this study soils are very similar throughout the study area.	The Dundee soil form covers the whole area, with a poorly expressed orthic A horizon. The texture is sand with 37 % gravel fragments on average. The gravel is of a variety of sizes. Similar soils are expected to cover most of the surroundings and are only broken by alluvial deposits next to the river. The proposed development will have a direct impact on 150 ha of soils. No special features have been encountered and in terms of geology and soils the site is considered of low sensitivity.	
		Without mitigation: Low	**With mitigation: Low**
Land use and cover (Refer Par. 5.5)	The proposed footprint will be localised, but will impact on grazing land utilized by at	The proposed project will be located on communal land owned by the Municipality, and is currently used as grazing for goats by local inhabitants (at least two families). It is a fact that this area has a very low carrying capacity and that the proposed project should result in significant social	

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING	
	least two families.	investment and job creation. However, the families relying on this land for its grazing will have to be given alternative grazing areas or will have to benefit in some other way from this project. Mitigation should entail, relocating the families onto similar grazing land or compensating them in some other way.	
		Without mitigation: High	**With mitigation: Low**
Potential impacts on threatened or protected ecosystems			
Vegetation type(s) (Refer Par. 5.7 & 5.8)	Eastern Gariep Rocky Desert covers the terrain.	The vegetation type is classified as "Least threatened" with approximately 99.7% of this vegetation type remaining. However, at present, none of this vegetation type is formally conserved. Still it is considered highly unlikely that the proposed project will have any significant impacts on local or regional conservation targets. Mitigation: maintain the corridor function of the surrounding rocky desert areas.	
		Without mitigation: Low	**With mitigation: Low**
Conservation priority areas/networks and connectivity. (Refer Par. 5.11)	Namakwa District Biodiversity Sector Plan (Desmet & Marsh, 2008)	According to the CBA map for the Henkries area (Figure 7) the proposed site and almost the whole of Henkries are located within a proposed CBA 1. Ideally the proposed site should have been placed outside of the proposed CBA. In this case there is no land available at Henkries that will place a development of this size outside of the proposed CBA areas and still within easy access of irrigation. This is also the only and most likely area for any such agricultural development near to the existing agricultural hub. Mitigation: maintain the corridor function of the surrounding rocky desert areas coupled with alien eradication.	
		Without mitigation: Medium	**With mitigation: Low**
Protected plant species (Refer Par. 5.10)	Sixteen (16) individuals of Boscia albitrunca (Protected in terms of the NFA) were encountered spread throughout the site. Seven plant species protected in terms of the NCNCA was observed. However, a number of these were common pioneer species from the Aizoaceae family.	Sixteen trees listed in terms of the NFA trees were encountered within the larger site. However, only 7 of these trees are within the proposed footprint and with slight alterations, more of these trees can be safed. Previous experience showed that both Camelthorn and Sheppard's tree have deep root systems, which mean excavation can be done quite close to the tree without impacting on the root system. It is unavoidable that a number of plants protected in terms of the NCNCA will be impacted by the proposed development. However, most of these species are common pioneer species and the impact on the populations of these species will be negligible. Mitigation should entail excellent environmental control, slight layout alterations to avoid as many mature indigenous tree species as possible; good topsoil conservation and rehabilitation practices; and application for permits in terms of the NFA and the NCNCA.	
		Without mitigation: Medium	**With mitigation: Low**
Fauna & Avi-fauna (Refer Par. 5.12)	Although natural fauna and avi-fauna is likely to be present, it is expected that it would be limited to small game, avi-fauna, insects and maybe some reptile's species.	Human activity in the area is medium-high and the property is grazed by at least two families. **Mammals**: The site visit showed very little evidence of the presence of game species (e.g. droppings, skeletons etc.) The Henkries area encompasses a very large range of natural veld and it is highly unlikely that the proposed development will have a significant impact on habitat or migration routes. **Reptiles**: The open sandy plains, is not expected to house great numbers of reptile species (limited cover). The surrounding rocky outcrops, on the other hand, will have much more cover and habitat features favoured by a larger variety of reptile species. As a result, the impact on reptiles should be negligible. **Amphibians**: No suitable breeding places were observed on the proposed site and it is highly unlikely that the proposed development will have any significant impact on amphibian species. **Avi-fauna**: The open sandy open plain is likely to provide a habitat for certain bird species as will the small number of full grown indigenous trees that were encountered on site. However, shelter, food and the number of trees and other edibles is a rarity and unlikely to attract bird species in great numbers and the proposed development is not expected to have a significant impact on indigenous avi-fauna. The planting of vineyards and	

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING	
		date palms, on the other hand, is likely to attract a number of fruit and insect eating bird species (and their predators). Mitigation should entail minimising the impact on indigenous tree species.	
		Without mitigation: Low	**With mitigation: Low**
Rivers & wetlands (Refer Par. 5.6)	No rivers or streams were observed, but a few episodic, non-perennial drainage channels were observed.	The proposed development will be located on an open sheet washed valley floor with a very low gradient within a hyperarid region. Much of this rainfall is experienced in thunder storms. Rainfall can at best be described as episodic or sporadic, and water will only flow for very short periods of time (Non-perennial), with intervals that can vary greatly. As a result the soils will rarely be inundated for longer than a couple of days at a time (if so long). Mitigation will ensure that the development incorporate storm water management (drainage of water during thunderstorm events).	
		Without mitigation: Low	**With mitigation: Low**
Invasive alien infestation (Refer Par. 5.13)	A few *Prosopis* species were observed scattered throughout the property.	At present the infestation is low, but it is vital that the further spreading of this species is stopped. All listed invasive alien species must be removed from the property. However, incorrect alien control methods used for especially *Prosopis* species may aggravate the situation and result in spreading in place of control of these species. Mitigation will entail correct alien control methods coupled with follow up work after rehabilitation.	
		Without mitigation: Low	**With mitigation: Positive**
Potential direct impacts			
Direct impacts	Refers to those impacts with a direct impact on biodiversity features.	The proposed project will have a direct impact on 150 ha of natural vegetation (least threatened), which includes protected plant species. It will have a significant impact on two families utilising the grazing land, and is likely to have a low impact on a very limited number of fauna species, but might result in a positive impact on a number of avi-fauna (attracted by the fruit of the harvest). Impact is considered real, but not substantial. Mitigation will include all the mitigation aspects discussed above.	
		Without mitigation: Medium	**With mitigation: Low**
Potential indirect impacts			
Indirect impacts	Refers to impacts that are not a direct result of the main activity, but are impacts associated or resulting from the main activity.	The proposed project will have indirect impacts like the establishment of temporary lay-down areas, reservoirs, temporary construction sites and concrete mixing areas. However, with good environmental control it will be possible to minimise the impact of such indirect impacts. Mitigation will entail excellent environmental control and rehabilitation in accordance with approved management plans, placement of temporary lay-down areas or construction sites within areas that are not environmentally sensitive and will not impact on protected plant species. It will also entail good waste and wastewater control.	
		Without mitigation: Medium	**With mitigation: Low**
Potential cumulative impacts			
Cumulative impacts	Refers to the cumulative loss of ecological function and other biodiversity features on a regional basis.	The proposed project will have a permanent but localised impact. However, it is considered unlikely that the cumulative impact will result in significant additional impact on local or regional biodiversity targets, but it will have a localised impact on protected plant species and on the grazing rights of at least two families (although carrying capacity is very low). Mitigation will entail excellent environmental control and all of the mitigation measures addressed above.	
		Without mitigation: Medium	**With mitigation: Low**

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING
The No-Go Option		
The No-Go Option	The "No-Go alternative" does not signify significant biodiversity gain or loss especially on a regional basis.	The loss of full grown protected tree species, the potential impact on natural fauna and the potential impact on land-use and grazing rights will be negated. However, it will prevent a considerable socio-economic investment and job creation. One of the main issues of this area being very limited job opportunities. The no-go option will mean that these potential economic gains will be lost to the province.

8. SUMMARY

Having evaluated the biodiversity aspects and associated impacts pertaining to the proposed development, the author is of the opinion that the proposed project can be located on Steenkampspan (419/6) in such a way as to minimise the potential and actual impact on the identified environmental features and at the same time conforming to the objectives of the Draft Siyanda Municipal EMF.

The evaluation of the potential environmental impacts indicates the most significant potential impacts identified where:

- The potential impact on a great number of NFA protected tree species, especially *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca*.
- The potential impact on reptile species as a result of the excavation of the granite outcrop (and associated habitat destruction).
- The potential impact on NCNCA protected plant species, especially *Boscia foetida* (very localised)
- The potential impact on temporary wetland features.

However, with appropriate mitigation it is considered highly unlikely that the proposed project will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to development and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity

Lastly it is felt that good environmental planning and control during development planning, the appointment of a suitably qualified ECO and the implementation of an approved EMP, could significantly reduce environmental impact.

With the available information to the author's disposal it is recommended that project be approved, provided that mitigation is adequately addresses (with special focus on the minimisation the impacts on indigenous tree species).

9. RECOMMENDATIONS

Namakwa district is one of very few areas in South Africa where high quality arable land together with water licenses from the Orange River are readily available for the economic development of local communities. The proposed Henkries development forms part of the Orange River Emerging Farmer Settlement and Development Program which centres on economic growth, the development of rural communities and economic empowerment through the development of irrigation land into intensive agricultural production units in the Northern Cape. Agricultural development has the potential to unlock the economy of this region through irrigated farming with high value crops. It is expected that the proposed establishment of a Mega-Agripark at Henkries act as a significant stimulus to the economy of this region. It is proposed that through agriculture, sustainable economic growth, job creation and economic empowerment of this community will be promoted. The scope of the Henkries project will be to develop approximately 130-150 ha of high potential arable land near Henkries. This development is designed to act as catalyst for the development of a further 3 000 ha of arable land which is located in eleven distinct areas of the Namaqualand District.

Having evaluated and discussed the various biodiversity aspects associated with the proposed development, the most significant possible impacts identified are:

- The Henkries settlement falls within identified CBA areas in accordance with the Namakwa District Biodiversity Sector Plans. However, all aspects of the proposed project will be located within the larger Henkries settlement footprint, which are already impacted as a result of agricultural and urban settlement, especially if compared with the natural vegetation further away from the settlement.
- The impact on the grazing rights of the occupiers of the land (grazing goats on the proposed development site).
- The likely impact on protected tree and plant species.

It is, however, considered highly unlikely that the proposed project will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity

Good environmental planning and control during construction and good rehabilitation after construction will ensure that environmental impacts are minimised throughout the construction phase.

With the available information to the author's disposal it is recommended that project be approved since it is not associated with significant environmental impact, provided that mitigation is adequately addresses.

9.1 IMPACT MINIMIZATION

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer (ECO) must be appointed to monitor the construction phase in terms of the EMP as well as any other conditions which might be required by the Department of Environmental Affairs.
- Current land users (occupiers) must be notified of the proposed project and must be suitably compensated.
- An integrated waste management system must be implemented during the construction phase. All rubble and rubbish (if applicable) must be collected and removed from the site to a Municipal approved waste disposal site.
- All alien vegetation should be removed from the larger footprint and its immediate surroundings.
- All efforts must be made to minimise impact on mature indigenous trees within the final footprint (especially protected species).
- Permits must be obtained for the removal of any protected species which might be encountered.
- Topsoil must be removed (the top 15-20 cm of soil) from all laydown- and/or construction related sites outside of the agricultural footprint. All such areas must be re-instated/rehabilitated on completion of the project. Topsoil must be protected and stored separately during the construction phase for rehabilitation purposes. Rehabilitation must commence as soon as possible after such sites are not used anymore.

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