STEENKAMPSPAN PROVING GROUND

Proposed establishment of a high speed proving ground (& associated infrastructure) on the farm Steenkampspan (No. 419/6), Upington
ZF Mgcawu (Siyanda) District Municipality, Northern Cape Province.

BIODIVERSITY & BOTANICAL SCAN

Revision 1 ***(revised as a result of layout revisions)***

Biodiversity & Botanical scan of the proposed footprint areas to determine the possible impact on biodiversity with emphasis on vegetation and plant species

20 November, 2015

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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. Remuneration for services is not linked to approval by decision making authorities and PB Consult has 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 here are based on the author's best scientific and professional knowledge and available information. PB Consult reserves the right to modify aspects of this report, including the recommendations if new information becomes 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 has been employed 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 assessments and developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits. He was also responsible for helping develop the botanical part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 botanical 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 NEMA applications, biodiversity- and botanical assessments, 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.

SUMMARY - MAIN CONCLUSIONS

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SUMMARY OF POSSIBLE SIGNIFICANT BIODIVERSITY FEATURES			
Potential impacts on biophysical environment			
Geology & soils	Geology & soils vary only slightly in the larger study area. But a small granite porphyry outcrop (Inselberg) was encountered	In general the geology and soils vary only slightly over most of the site, consisting either of aeolian sands or exposed calciferous material. However, on small granite porphyry outcrop was encountered and was identified as a source of road building material. In terms of geology or vegetation the outcrop is not considered of significant importance, however, it is likely to support a number of reptile and bird species. Mitigation will entail search and rescue of reptile species and timing the work to be outside the breeding season for owls (the bird nesting being most likely the Spotted eagle owl).	
		Without mitigation: Medium	**With mitigation: Medium/Low**
Land use and cover	The proposed footprint will be localised, relatively small and should not lead to long term land-use impacts (apart from the physical footprint)	The area is been utilised mainly for grazing. The impact is considered localised with regards to land use. Mitigation entails keeping the footprint as small as possible and allowing natural process to continue (as much as possible) on the remainder of the property.	
		Without mitigation: Medium/Low	**With mitigation: Low**
Potential impacts on threatened or protected ecosystems			
Vegetation type(s)	Gordonia Duneveld (Least threatened, with more than 99% remaining).	The vegetation type is classified as "Least threatened" and the impact considered localised and relatively small. It is considered unlikely that the proposed project will have any significant impacts on local or regional conservation targets. It might in fact add to regional conservation targets as the remaining natural veld will be protected from stock grazing practices. Mitigation entails keeping the footprint as small as possible and allowing natural process to continue (as much as possible) on the remainder of the property	
		Without mitigation: Low	**With mitigation: Insignificant**
Corridors and conservation priority areas/networks.	Draft Environmental Management Framework (EMF) for the Siyanda District Municipality.	According to the EMF, Gordonia Duneveld has a low conservation priority, and low sensitivity index. However, the soils have a wind erosion potential which will have to be managed. Mitigation will entail minimising the footprint and to ensure erosion control through good rehabilitation. Correct alien eradication will also be important.	
		Without mitigation: Medium/Low	**With mitigation: Low**
Protected plant species	No SA red list species was observed. Three (3) tree species protected in terms of the NFA was encountered. Three (3) plant species protected in terms of the NCNCA was observed.	A great number of trees listed in terms of the NFA trees were encountered within the proposed footprint areas. However, with good mitigation between 90 – 95% of these trees can be conserved. 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. Three species protected in terms of the NCNCA were encountered. Individuals of at least one species will be impacted by the proposed development. Mitigation will 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: High	**With mitigation: Medium/Low**
Fauna & Avi-fauna	All larger animal species will have to be excluded from the terrain for safety purposes. Also impacts on mature trees and granite outcrop.	Very few larger game species was observed or are expected as a result of the current land use practices (intensive stock grazing) and the impact on larger fauna is thus expected to be low and localised. The removal of larger trees and the granite outcrop will impact on local habitat may impact significantly on regional conservation targets, especially with regards to protected reptile species. Mitigation will entail minimising footprint and the impact on mature indigenous tree species and implementing search and rescue of fauna species during construction.	
		Without mitigation: Medium/High	**With mitigation: Medium/Low**
Rivers & wetlands	No rivers or streams were observed, but two areas that show temporary wetland characteristics were identified (Grundling & Rossouw, 2014)	The project and especially the excavation of road building material have the potential to impact on these wetland features. Mitigation will entail protecting the wetland area and a buffer zone surrounding the wetland area.	
		Without mitigation: Medium/Low	**With mitigation: Insignificant**
Invasive alien infestation	Low, but persistent *Prosopis* infestation was observed throughout the property.	At present the infestation is low, but it is already spread across most of the property and it is vital that the further spreading of this species is stopped as soon as possible. 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: Medium	**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 natural vegetation, which is likely to include protected plant species in terms of the NFA and NCNCA. It will also impact on small wetland areas, a granite outcrop and potentially on fauna and avi-fauna (especially reptile species). However, most of the impacts can be negated and are considered localised. Mitigation will include all the mitigation aspects discussed above.	
		Without mitigation: High	**With mitigation: Medium/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, quarry sites for road building material, 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/High	**With mitigation: Medium/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 might have an impact on protected reptile species). Mitigation will entail excellent environmental control and all of the mitigation measures addressed above.	
		Without mitigation: High	**With mitigation: Medium/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. However, it will ensure that none of the potential impacts above occur.	The loss of full grown protected tree species will be negated. The potential impact on natural fauna will be negated (especially the potential impact on reptile species associated with the rocky outcrop). The potential impact on land-use and wetland areas will be negated. However, it will also mean that a potential source of additional income, not only during construction but also during operation is denied the Municipality. The Northern Cape Municipalities has identified the need for development and tourism as one of the potentially most significant sources of income. The marketing and use of the transportation infrastructure, especially Upington Airport and the major roads, to create a regional and even international hub for imports, exports and cargo handling/distribution is also seen as a potential source of income. The no-go option will mean that these potential economic gains will be lost to the province.

RECOMMENDATION

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)

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).

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1. INTRODUCTION

Mercedes-Benz SA is evaluating various land options on which to develop and realize a proving ground for vehicle testing in the Northern Cape region of South Africa. The goal of the project is the establishment of a proving ground, which will be operated between October and April for all heat-relevant vehicle tests with the following requirements:

- Development of a light vehicle car test and proving ground in hot climate conditions.
- Stability of the surfaces of each individual module as testing processes run only seasonally and have several months of interruption in between the test periods
- Design of the test modules for the use by passenger cars (not trucks)
- Design and execution of the construction works, such as road and drainage construction, steel frame-work building etc., following the national common standard and methods
- Self-sustaining electrical energy supply
- Measures against vandalism and burglary.

Various properties in the Northern Cape (Upington area) were investigated/evaluated. After a due diligence process and feasibility studies were completed Portion 6 of the Farm Steenkampspan No. 419, Upington was chosen as the most suitable site in terms of location, size, owner's consent and access (henceforth referred to as Steenkampspan or the property). Steenkampspan is located approximately 38 km northeast of Upington (on the gravel road past the Upington International Airport). The property is approximately 3 750 ha in size on which the intention is to build a high speed oval track. Associated infrastructure includes a Handling track, a Multifunctional area, Gravel bad roads, Gravel access roads, Asphalt access roads, Bridge across Oval track, a Building area, Security fencing, Single-lane maintenance roads along fences.

Please note that this is a revision (Revision 1) of the original Biodiversity and botanical scan done by PB Consult for the same project dated 20 February 2015. The revision was requested as a result of significant layout changes. Please refer to the revised project description.

1.1 TERMS OF REFERENCE

PB Consult was appointed to conduct a biodiversity and botanical scan of the proposed development footprint.

PB Consult was appointed within the following terms of reference:

- To determine the potential impact on significant biodiversity features on the hand of desktop studies, available literature/information and a field study.
- To determine the occurrence of threatened or sensitive vegetation types, plant communities and plant species in context.

- To assess habitat sensitivity and the impact on species with emphasis on protected species encountered.
- To consider short- and long-term impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.
- To make recommendations on impact minimisation in terms of the proposed project

The study includes the following:

- A brief discussion of the local environment in order to provide background on the ecological factors influencing the ecological drivers associated with the specific area.
- A brief discussion of the vegetation types expected and encountered with emphasis on protected species encountered.
- A list of plant species encountered during the site visit.
- 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 based on the field survey and from available literature.
- An evaluation of the potential impact of the proposed project on habitat and species.
- A discussion of significant impacts focusing on possible mitigation and amendments to the development proposal.

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** (R543 of 2010): 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): which provides for the sustainable utilization of wild animals, aquatic biota and plants.

3. DEFINITIONS & ABBREVIATIONS

3.1 DEFINITIONS

Contaminated water: means water contaminated by the activities associated with construction, *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 a river, a water course and an ephemeral stream as encountered in the study area.

- 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.
- Water course: 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.

- Ephemeral stream: 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)
DEA	Department of Environmental Affairs
EAP	Environmental assessment practitioner
EIA	Environmental impact assessment
EMF	(Municipal) Environmental Management Framework
EMP	Environmental management plan
IDP	Integrated development plan
NCNCA	Northern Cape Nature Conservation Act, 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 DESCRIPTION

The following is based on information supplied by Mercedes-Benz South Africa (dated 14 July 2015). Please refer to the Mercedes Bens South Africa – New proving ground South Africa, Specification Book, Preliminary Design (Ingen/Aix GmbHl).

4.1 GENERAL SPECIFICATIONS

- Development of a light vehicle car test and proving ground in hot climate conditions;
- Stability of the surfaces of each individual module as testing processes run only seasonally and have several months of interruption in between the test periods;
- Design of the test modules for the use by passenger cars (not trucks);
- Design and execution of the construction works, such as road and drainage construction, steel frame-work building etc., following the national common standards and methods;
- Self-sustaining electrical energy supply;
- Measures against vandalism and burglary.

4.2 MAJOR FACILITIES

The goal of the project is the establishment of a proving ground, with the following requirements:

- High Speed Oval (length approx. 17 km) including 4 lay-by areas, run offs and guard rails (which is smaller than the original oval of 19 km);
- Handling Track (length approx. 5,5 km) incl. bypass and run offs (asphalted and gravel);
- Multifunctional Area (size approx. 150 x 400 m, acceleration lane 25 x 600 m) and return lanes (width approx. 8m);
- Grades/Slope Hill including 10%, 15% and 20% grades;
- Gravel Bad Roads (length approx. 10 km);
- Gravel Access roads (length approximately 2 km including gravel parking areas (approx. 2,500 m^2);
- Asphalt paved access roads on "confidential side" (length approx. 2,5 km including paved parking areas (approx. 3,000 m^2)
- Asphalt paved access roads on "public side" (length approx. 2,5 km including paved parking areas (approx. 2,000 m^2), turning bays and lay-by areas;
- Bridge along access roads crossing the high speed oval;
- Building area according to separate plan (buildings, infrastructure, privacy and security fencing, road and civil constructions);
- Guard house at main entrance;
- Security fencing around farm and agricultural fencing on farm;
- Single-lane roads for maintenance and farming purposes along fences (50 km) according to local standard.

Construction material for road construction is supposed to be mined on the property:

- G7-G10 as bulk fill material
- G3-G5 for base/sub base
- Probably G1 for asphalt paving (depending on test results)

Water for operation and construction shall be obtained from ground water as far as possible.

Figure 1: Schematic view of the proposed development on the farm Steenkampspan (419/6)

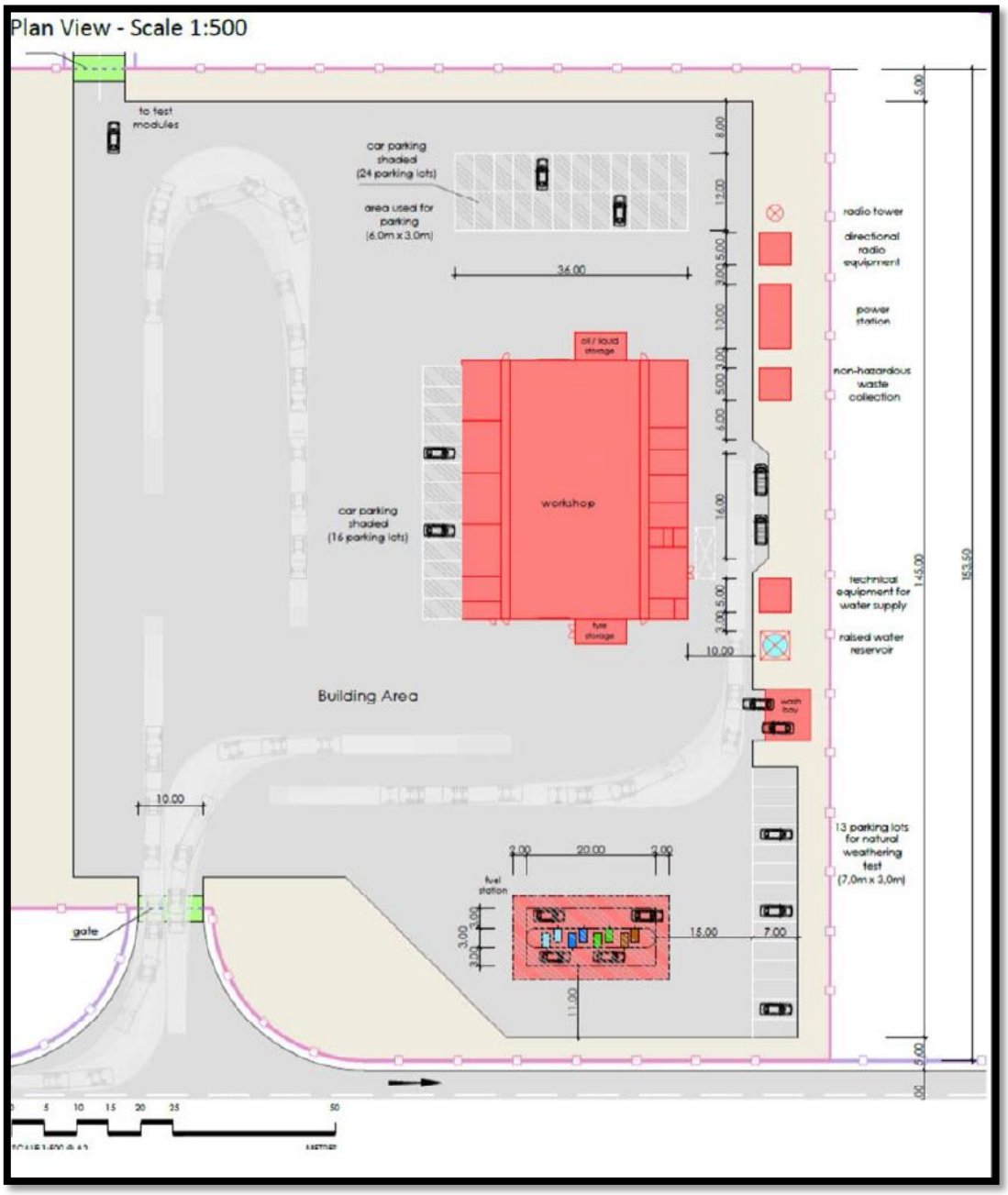
4.3 BUILDING AREA

The proposed building area will consists of the following elements (Refer to Figure 2)

- One single-storey workshop-office building, size approx. 40 x 35 m, including medical center and dispatcher room;
- Roofed and semi-closed car wash area attached to main building;
- Closed single-storey building for electrical infrastructure;
- Closed single-storey building for water supply incl. base and high reservoir;
- Closed single-storey building for waste storage;

- Underground facility for sewerage storage or septic tank;
- One flying roof for 40 cars;
- Combined security/privacy fence around building area;
- Asphalt paved area around buildings (designed for trucks up to 56,000 kg max total gross weight with max axis load acc. National Road Traffic Act 93 of 1996 sections 234ff)
- Roofed fuel station;
- Guard House at main entrance to proving ground;
- Distribution cabinet near tower for directional radio;
- Concrete paved areas where necessary due to legislation (e.g. fuelling areas and car wash);
- Parking lots for long-term natural weathering and aging tests (up to 2 years parking of cars, Drainage requirements?).

Figure 2: Schematic view of the proposed building zone



5. ENVIRONMENTAL EVALUATION: METHODS USED

5.1 INITIAL SITE VISIT

Desktop studies of the proposed site were done before any site visit was performed in order to get a feel for the expected biodiversity features and vegetation types. This included scanning through available literature and initial preparation of biodiversity maps. An initial site visit was performed on the 1st and 2nd of September 2014 to get a feel of the property and the scale of the project. At the same time the author did a preliminary biodiversity and botanical scan of the areas visited and some plant identification were possible. The main feature of significance was the large numbers of protected tree species in terms of the National Forest Act, Act 84 of 1998 (NFA) that was encountered (spread out over the terrain). This included *Acacia erioloba* (Camelthorn tree) and *Acacia haematoxylon* (Grey Camelthorn Tree) as well as *Boscia albitrunca* (Sheppard's tree). A number of the (*Acacia erioloba* x *Acacia haematoxylon)* cross was also observed (because both species are protected the cross are also regarded by the Department of Forestry and Fisheries as protected under the same law). Plant species protected in terms of the Northern Cape Nature Conservation Act, Act 9 of 2009 (NCNCA) was also observed (e.g. *Boscia foetida* and *Aloe* species). No water courses or wetlands were observed, but the linear presence of a number of *Parkinsonia africana* (Green-hair thorn tree) was observed and noted. Although this tree does not necessary indicate water (especially on its own), it associates with streams more often than not, and as such was identified as an area that will need further attention (site visit).

5.2 DESKTOP STUDIES

On completion of the initial site visit, a more detailed desktop study was done, using the SANBI: BGIS online land use planning tools and Municipal biodiversity or conservation plans. Maps, images and species checklists were prepared in order to advise and guide the biodiversity and botanical assessment. Overlays of the proposed footprint areas were located on these maps and GPS co-ordinates were established for each of the proposed footprint areas. Significant biodiversity features associated with the larger surroundings were identified, and researched. The desktop study also took into account the biodiversity status as classified in the National Spatial Biodiversity Assessment (2004) as well as the 2011 National Spatial Assessment or National List of Threatened Ecosystems (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), Municipal Biodiversity Sector Plans and Municipal Critical Biodiversity Areas (CBA's) into account where applicable. In the case of the ZF Mgcawu (Siyanda) DM, the Municipal Biodiversity Summaries Projects (2010) was the most relevant Biodiversity conservation plans (SANBI: BGIS). However, a draft Environmental Management Framework (EMF) for the Siyanda District Municipal was published in 2008, and even though this report was never formally approved, the findings were also used to guide decision making for this report.

5.3 FIELD STUDY

The original field study and site survey was done over a 4 day period during November 2014. A follow-up field study was performed during October 2015 (14-16th of October 2015) to evaluate the new areas that will be impacted by the revised layout plans. It was conducted by physically walking each of the proposed footprint areas, examining, marking and photographing any area of interest. 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 may indicate special botanical features (e.g. salt marsh areas, rocky outcrops or silcrete patches). In this way more than 300 protected tree species alone, were marked within the proposed footprint and its immediate surroundings (which will have to address through impact minimisation strategies).

5.4 TIMING OF SITE VISIT

Ideally all botanical studies should at least cover the four main seasons of the year in order to get a good understanding of the vegetation of any particular area. The property is located within the area habitually referred to as the Kalahari. The Kalahari is not a true desert, but rather an arid savanna, characterised by grasses, shrubs and trees. The Kalahari Savanna in South Africa has a low species to area ratio, and become even lower in the southern Kalahari part of the biome (with a sharply decreasing diversity of trees from east to west). In this case the main site visit was done during November, which is at the start of the rainy season (summer thunder storms) and almost the hottest part of the year. As such very few herbaceous or annual species were visible. Although the site was still experiencing a dry spell (which was reflected in the general status of the plant species) it was possible to make positive plant identification in most cases.

Thus the timing of the site visit was adequate. Perennial plants and a good number of seasonal 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 status in the area was obtained. Previous experience of this vegetation type and the earlier site visit enabled the author to be quite confident in the findings.

6. DESCRIPTION OF ENVIRONMENT

The aim of this description is to place the study area in context with regards to all significant biodiversity features which are expected and or were encountered within the study area. The study area has been taken as the proposed footprint areas and its immediate surroundings.

6.1 LOCATION & LAYOUT

The Farm Steenbokspan (419/6) is located within the ZF Mgcawu District Municipality (formerly known as Siyanda District Municipality) northeast of Upington (Figure 3). Steenbokspan is approximately 3 730 ha in size and located just off the road by-passing the Upington International Airport. This road, off which the first portion is tarred or paved, becomes a gravel road just as it passes the Upington Airport. The farm is bordering on this road about 40 km northeast of Upington (Refer to Figure 4)

Figure 3: Location of the farm Steenbokspan (419/6) in relation to Upington (Northern Cape Province)

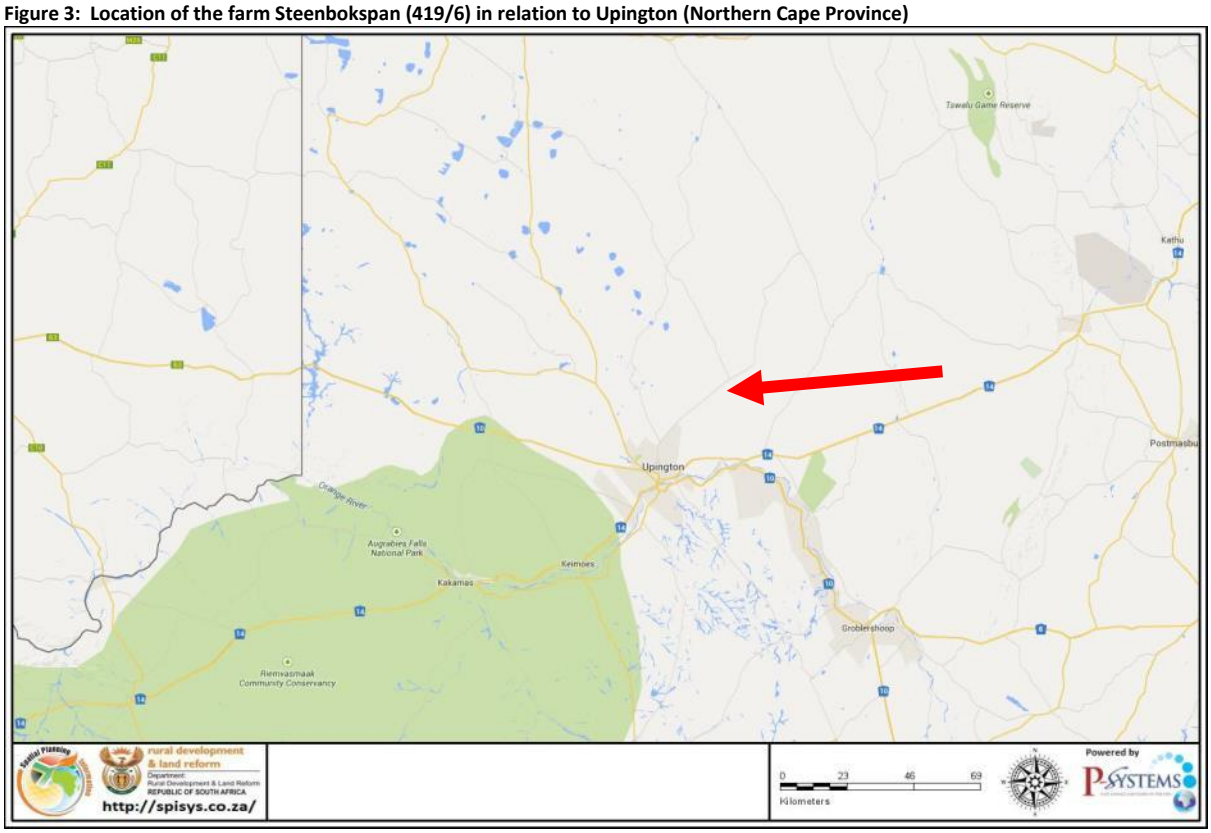
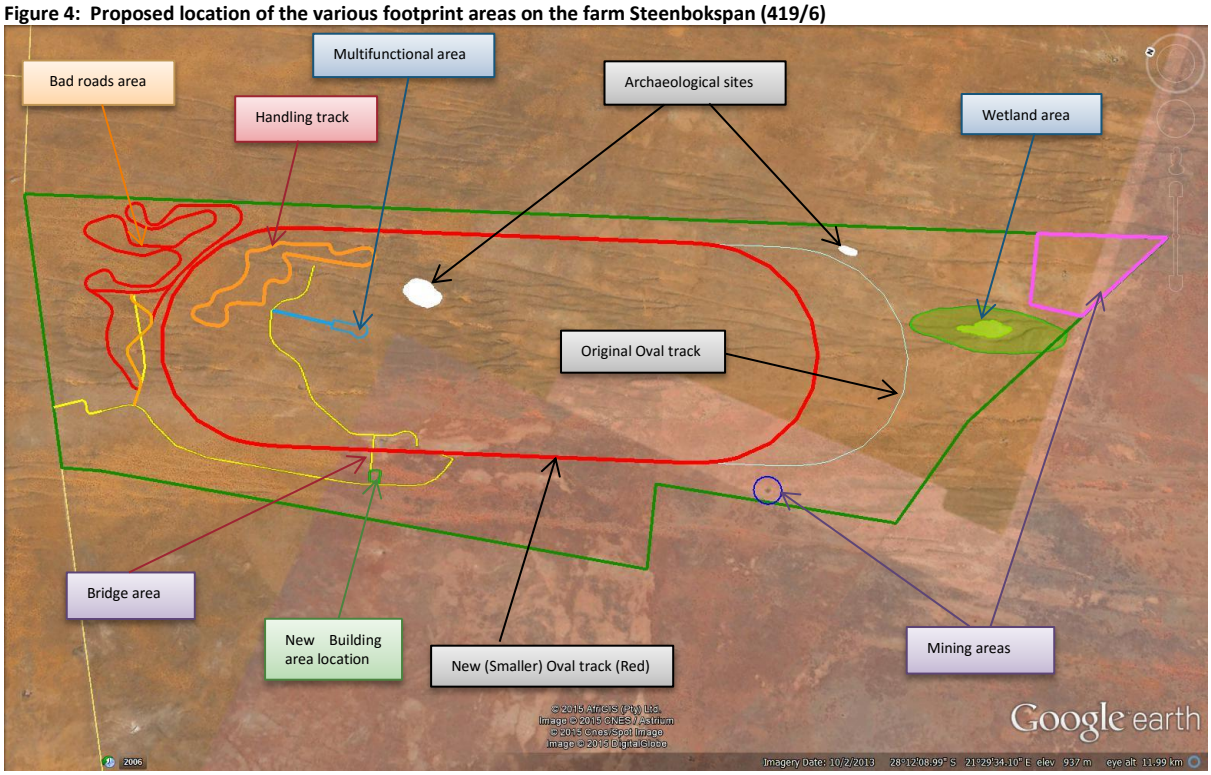


Table 1: GPS coordinates applicable to the proposed footprints areas of the Steenkampspan proving ground (Refer to Figure 4)

DESCRIPTION	LATITUDE AND LONGITUDE	ALTITUDE
Turn-off to the farm Steenbokspan 419/6	S28 09 15.35 E21 27 55.67	963 m
Oval track northern loop	S28 09 39.76 E21 28 45.81	957 m
Oval track southern loop	S28 13 10.27 E21 30 27.90	924 m
Bad roads (midpoint)	S28 09 06.19 E21 29 00.36	970 m
Bridge area (midpoint)	S28 11 02.73 E21 28 36.30	947 m
Building area (midpoint)	S28 11 07.23 E21 28 27.50	950 m
Handling track area (midpoint)	S28 09 55.72 E21 29 26.87	953 m
Multifunctional area (midpoint)	S28 10 34.20 E21 29 20.68	947 m

DESCRIPTION	LATITUDE AND LONGITUDE	ALTITUDE
Granite mining area	S28 13 13.88 E21 29 26.51	925 m
Calcrete mining area	S28 14 26.79 E21 31 46.39	923 m
Archaeological site (north)	S28 10 51.82 E21 29 43.85	949 m
Archaeological site (south)	S28 13 07.63 E21 31 13.06	928 m
Wetland area	S28 14 04.77 E21 31 05.61	924 m

Figure 4: Proposed location of the various footprint areas on the farm Steenbokspan (419/6)



6.2 TOPOGRAPHY

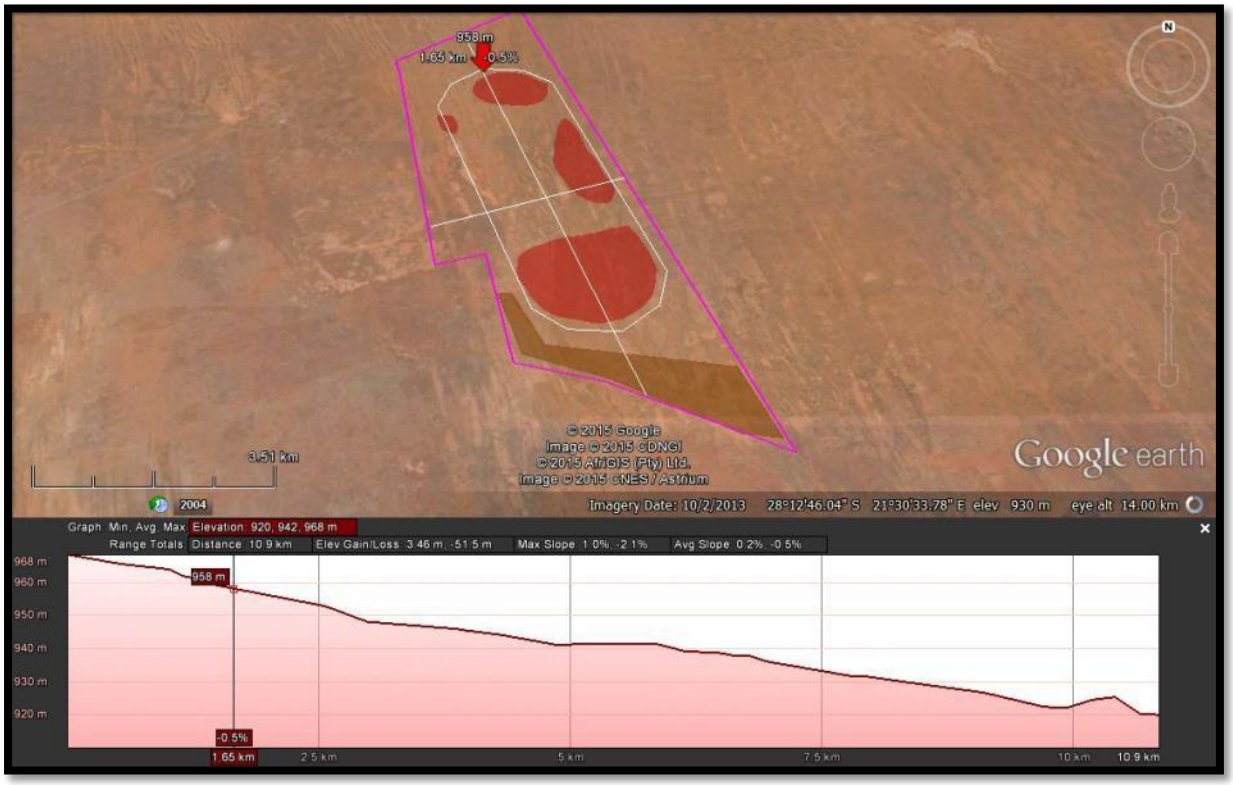
The Kalahari basin stretches northwards from just north of the Orange River into Botswana and Namibia. It is a flat, sand covered, semi-desert area, on average between 900 m to 1200 m above sea-level. It is characterised by a number of large pans to the north of Upington, by dry river beds (such as the Kuruman-, Nossob- and Molopo Rivers) and by dunes which strike north-west to south-east. The region is underlain by Karoo rocks and rocks belonging to the tertiary Kalahari Group. Outcrops are rare (Siyanda Draft EMF). The area in which the property falls, forms part of the Kalahari dale, and is typically characterised by continuous linear dunes and inter dune straaten. The landscape is one of the simplest in the world and consists mainly out of sandy dunes inter-specked with calciferous plains and dry pans.

The Kalahari is drained by three very sporadic flowing streams namely the Nossob-, Auob- and Molopo Rivers. Last recordings of flows in the lower reaches of the Molopo and Kuruman Rivers were in 1933 and again in the 1974/5 and 1975/6 season, but underground water within these river basins may occur.


Photo 1: Small rocky outcrop encountered

The property represents a typical Kalahari landscape with linear dunes and inter-dune straaten striking in a northwest - southeast direction. Calciferous outcrops are commonly found within the inter-dune straaten (where calcrete are just below the surface). The only feature of note in this landscape is the presence of a small rocky outcrop (sometimes referred to as an Inselberg) near the western boundary of the farm. In terms of elevation the landscape shows a very slight drop in elevation (average slope 0.2%) from north to south and east to west (Refer to Figure 5). Elevation varies from approximately 968 to 930 m from north to south and 940 to 934 m from east to west. The landscape is thus relatively flat and the only factor limiting line of sight being the height of the alternating dunes. On this property the largest dunes tends to be found almost in the middle of the north-south track area as well as towards the northeaster corner of the farm.

Figure 5: Elevation data shows a slight drop in elevation from north to south and east to west



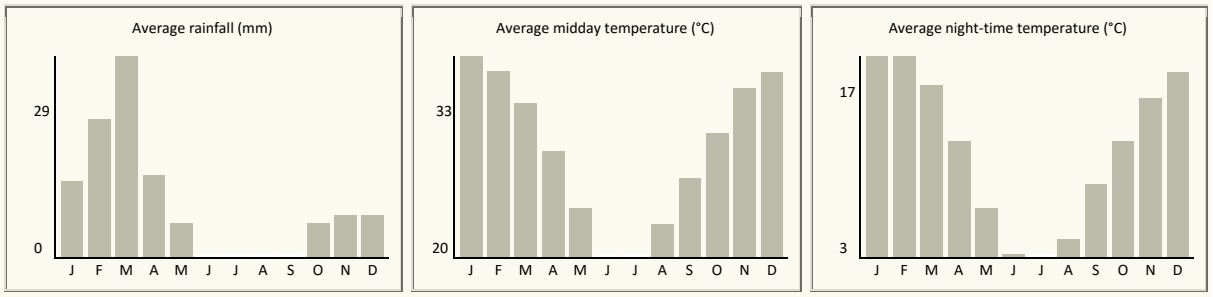
Due to the sandy nature of much of the soils the Kalahari is susceptible to wind erosion if the natural vegetation cover is disturbed. Pure sands (material with 95% or more with a particle size of 0.05-2.00 mm) are susceptible to being transported and re-deposited by strong winds whenever insufficiently protected by plant cover or windbreaks. Shifting sands tend to damage herbaceous, low-growing vegetation types and generate more shifting sands, starting a vicious circle. In itself the soils of the Kalahari has very little to no opportunities for productive use (Siyanda Draft EMF, 2008).

6.3 CLIMATE

The property shows a typical semi-desert or dry savanna climate. It is located in the summer rainfall region of South Africa and approximately 70 percent of the average rainfall occurs during the period October to April each year. Summer is very hot with maximum temperatures of up to 40°C and winters are cool to cold with average temperatures of 10°C, although it could drop to below 0°C coupled with typical frost. The predominantly wind direction is north-south with very variation in direction.

According to saexplorer (www.saexplorer.co.za), Upington normally receives about 94 mm of rain per year, with most rainfall occurring during autumn. The chart below (lower left) shows the average rainfall values for Upington per month. It receives the lowest rainfall (0 mm) in June and the highest (29 mm) in March. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Upington range from 19.8°C in June to 33°C in January. The region is the coldest during July when temperature drops to 2.8°C on average during the night. Consult the chart below (lower right) for an indication of the monthly variation of average minimum daily temperatures.

Figure 6: Average rainfall and temperatures for Upington (www.saexplorer.co.za)



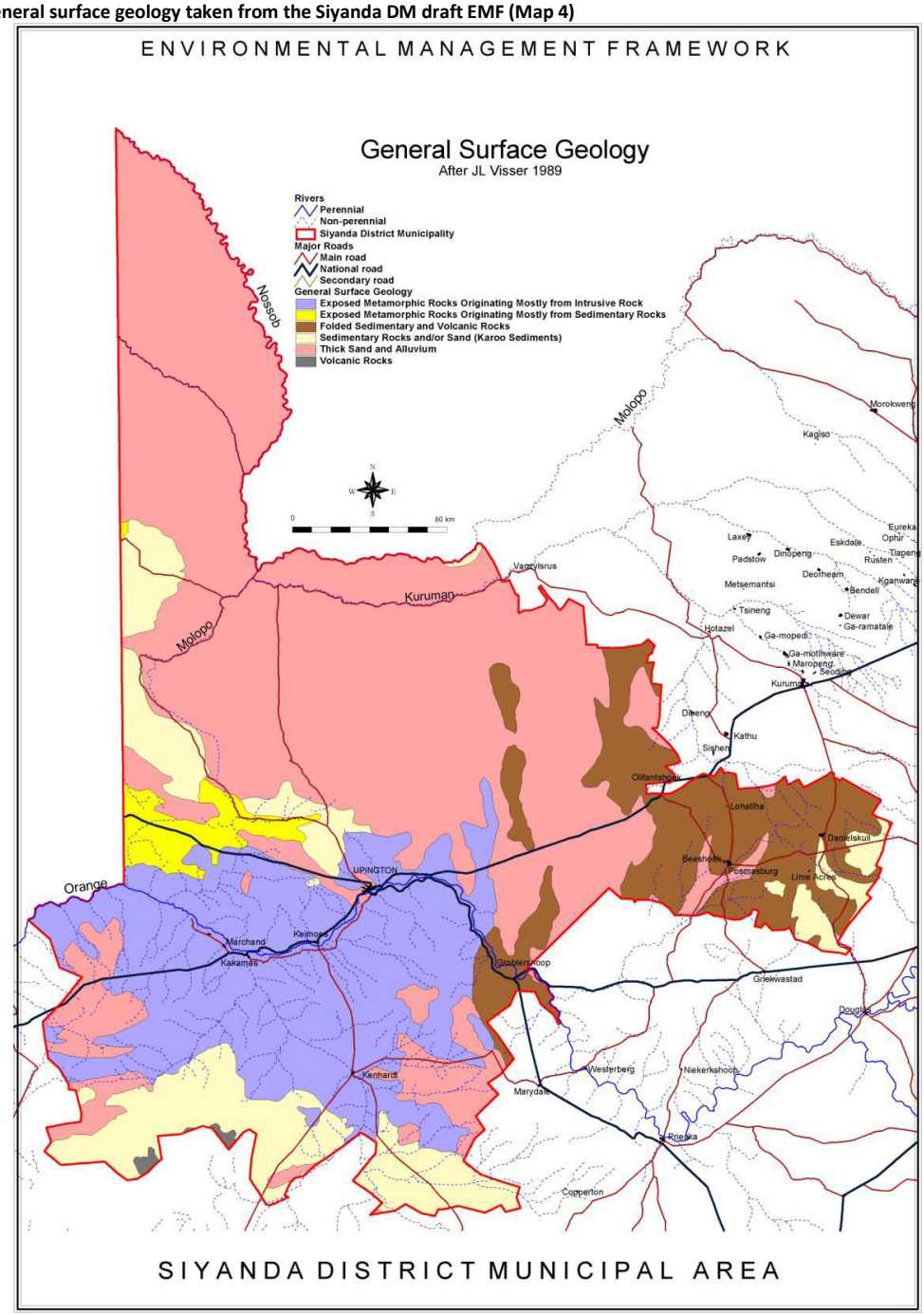
6.4 GEOLOGY & SOILS

According to the Draft Siyanda EMF, the property forms part of the great African plateau which was uplifted during the great Mesozoic and Tertiary earth movements. This plateau forms the largest part of the ancient continent of Gondwanaland which formally included eastern Brazil, southern India, Western Australia and Antarctica. In each of these fragments the general foundation is the same with an ancient surface of old rocks which together form the "fundamental complex" of the ancient land-mass. Over time this surface was covered by sedimentary beds in a freshwater inland lake and by means of windblown sand. Sedimentary beds refer to beds that formed from eroded material that weathered from existing surfaces that are deposited in a different place as a result of movement by water or wind (aeolian).

According to Mucina & Rutherford (2006) and the SANBI Biodiversity Geographical Information System, the geology and soils for this area differs slightly, but can be described as aeolian sand underlain by superficial silcretes and calcretes of the Kalahari Group. Mostly fixed parallel sand dunes with Af land type almost exclusively, while sandy soils of the Namib soil form may be expected on the flat plains. Outcrops of calcrete can be expected in certain duneveld types.

The geology and soils varies only slightly on the property and the only feature of note was the presence of a small rocky outcrop towards the west of the site. It consists of an outcrop of Blaauwbosch granite porphyry (Soilcraft 2014). According to the Draft Siyanda EMF (2008) these rocky outcrops are exposed metamorphic outcrops originating from intrusive rocks and the location of this specific outcrops are towards the northern end of its expected distribution (Refer to Figure 7) No other special features have been encountered (e.g. true quartz patches or broken veld).

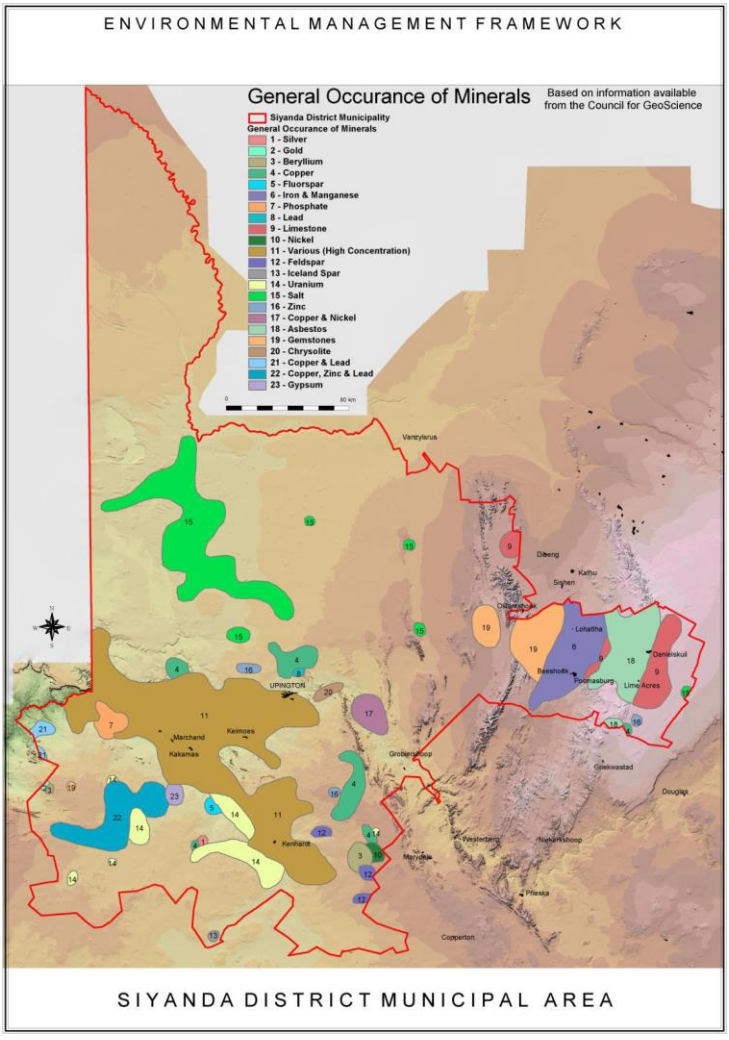
Figure 7: General surface geology taken from the Siyanda DM draft EMF (Map 4)



6.5 LAND USE AND COVER

The Kalahari area is predominantly used for stock and game farming. Live stock is marketed either locally or at auctions in Upington, or for slaughtering in Upington and Groblershoop. Game is mainly marketed seasonally as "biltong"-hunting for hunters from outside of the area. It is important to note that there is a definite shift amongst commercial farmers on the Botswana border to change from stock farming to game farming, due to the change in weather conditions and the poor access to water for their stock. Steenkampspan has been used for cattle and sheep farming over a long period of time, and although the effect of continual mono-species grazing can be seen, the property remains largely natural, with very little permanent impacts associated with the current land use option. In itself the soils of the Kalahari has very little to no opportunities for productive use (Siyanda Draft EMF, 2008) and without access to water productive agriculture is limited to game farming. With access to groundwater live-stock farming becomes a possibility as is the case at Steenkampspan. Existing infrastructure is limited to boreholes (wind pumps) fences, twee-spoor access roads, cattle pens and two small buildings (houses). The BGIS land use maps, shows that Steenkampspan and its immediate surroundings are expected to be remaining natural veld. According to the biodiversity summaries for the Siyanda District Municipality (SANBI, BGIS), 99.6% of the area is still covered by natural veld (only 0.4% of the area transformed).

Figure 8: Mineral potential map (taken from Draft Siyanda DM EMF, Map 6)



In terms of the proposed development, the existing land use (cattle & sheep farming) will only be viable in portions of the property as a result of the safety risk to cars being tested at high speed. For the same reason game farming will also not be a viable option. In fact all larger fauna will be moved outside the boundary fences of the property (safety reasons). Since stock and game farming are almost the only viable agricultural options for this property, its agricultural potential will be halted (for the time).

Please note that the agricultural potential of the site will not be compromised, apart from on the areas transformed as result of the proposed development, and could be continued whenever the proposed activity ceases to be relevant.

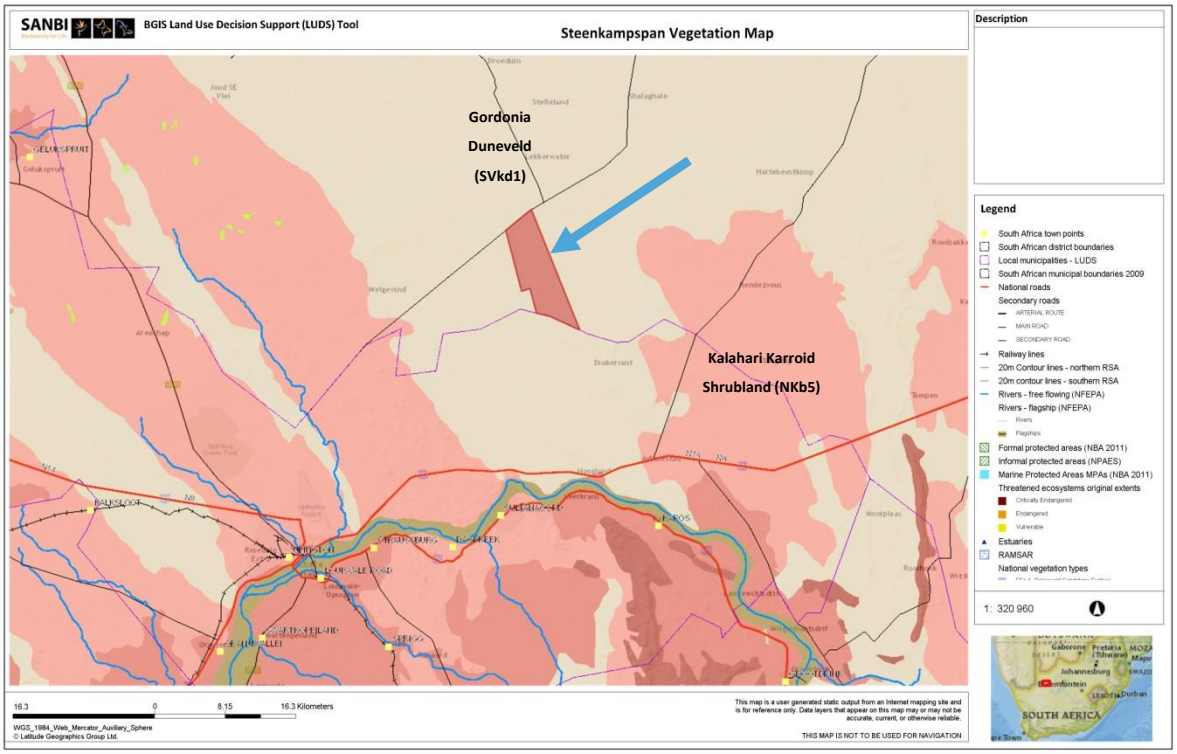
In terms of the Savanna Biome within the Siyanda District Municipality alone, Steenkampspan represents less than 0.001% of the land cover available. The impact of the proposed development in terms local or regional land use options will be very low and can be considered temporary in nature for most of the farms surface. It is highly unlikely that it will lead to any significant long term land use restrictions.

The only possible land use conflict being the fact that the property falls within an area which might have copper or lead mining potential (Refer to Figure 8).

6.6 BROAD SCALE VEGETATION EXPECTED

The property falls within the Savanna Biome (Kalahari Duneveld Bioregion). The Savanna Biome is the most widespread Biome in Africa and also occupies most of the northern part of the Northern Cape, including the Kalahari Duneveld. According to Rutherford *et al* (2006), the Savanna in South Africa has a low species to area ratio, and become even lower in the southern Kalahari part of the biome (with a sharply decreasing diversity of trees from east to west). On the other hand, Savanna is well known for its diversity of mammals. Rainfall seasonality and frequency are too unpredictable and winter temperatures too low to enable leaf succulents to dominate (like in the Succulent Karoo), while summers are too dry for dominance by perennial grasses alone, and the soils are generally too shallow and rainfall too low for trees.

Figure 9: Vegetation map of South Africa, indicating the property and broad scale vegetation types expected



According to the Vegetation Map of South Africa (Mucina & Rutherford, 2006) one broad vegetation type (Gordonia Duneveld) is expected on the property and its immediate surroundings. The status of this

vegetation type according to the 2004 National Spatial Biodiversity Assessment and the 2011 National Spatial Assessment or National List of Threatened Ecosystems (GN 1002, December 2011) is given in Table 2.

Table 2: Vegetation status according to the 2004 National Spatial Biodiversity Assessment and 2011 National Biodiversity Assessment

VEGETATION TYPE	NATIONAL STATUS 2011	REMAINING (2004)	CONSERVATION TARGET	FORMALLY CONSERVED
Gordonia Duneveld (SVkd 1)	Least Threatened	99.8%	16%	14.2%

6.6.1 Gordonia Duneveld

Rutherford *et al* (2006) describe Gordonia Duneveld open shrubland with ridges of grassland dominated by *Stipagrostis amabilis* on the dune crests and *Acacia haematoxylon* on the dune slopes, also with *A. mellifera* on lower slopes and *Rhigozum trichotomum* in the inter-dune straaten, occurring on parallel dunes 3-8 m above the plains. The small tree *Acacia mellifera* subsp. *detinens* is likely to occur, while tall shrubs like *Grewia flava* and *Rhigozum trichotomum* are common. Low shrubs like *Aptosimum albomarginatum*, *Monechma incanum* and *Requienia sphaerosperma* are frequent together with succulent shrubs which may include *Lycium bosciifolium*, *L. pumilum* and *Talinum caffrum.* Grasses are dominant and is likely to include *Schmidtia kalahariensis*, *Brachiaria glomerata*, *Bulbostylis hispidula*, *Centropodia glauca* (Kalahari-Gha Grass), *Eragrostis lehmanniana*, *Stipagrostis ciliata*, *S. obtusa* and *S. uniplumis*. The following herbs may also be encountered namely *Hermbstaedtia fleckii*, *Acanthosicyos naudinianus*, *Hermannia tomentosa*, *Limeum arenicolum*, *L argute-carinatum*, *Oxygonum dregeanum* subsp. *canescens* var. *canescens*, *Sericorema remotiflora*, *Sesamum triphyllum* and *Tribulus zeyheri*.

6.7 FINE-SCALE MAPPING (CBA'S)

The Municipal Biodiversity Summaries Projects (2010) are the most relevant Biodiversity conservation plans for the Siyanda Municipality (SANBI: BGIS). No fine-scale mapping is as yet available for this area and as a result no critical biodiversity areas or biodiversity support areas has been promulgated for this area. However, a draft Environmental Management Framework (EMF) for the Siyanda District Municipal was published in 2008, and even though this report is not formally approved, the findings can be used to guide decision.

The proposed priorities for conservation in the Siyanda District is depicted on Maps 12a (Refer Figure 10) and 12b of the EMF and are based on local occurrence, the national conservation target, the national ecosystem status and the national protection level of the vegetation types. A proposal is made for the prioritisation of vegetation types in the Siyanda District Municipality (now ZF Mgcawu District Municipality). The land cover of the Siyanda district reflects the results of the 2000 national land cover determination and is depicted on Map 13 of the EMF from which it is evident that most of the area is still in its natural state. A sensitivity index is shown on Map 14 of the Draft EMF (Figure 10 of this report). The main factors that were used to compile the index include the erosion potential of soils, the conservation priority of veld types, topographical areas with a high variance in shape and form, all watercourses, drainage lines and pans (including a 32 m buffer on either

side) and transformed areas. Map 14 of the EMP give a scale of -1 (transformed) to 8, where 8 represent the highest environmental sensitivity.

Environmental control zones are depicted on Map 15 of the EMF. The purpose of environmental control zones is to indicate areas that require a specific type or regime of control due to unique environmental elements that occur in these areas. It may or may not be linked to the application of EIA legislation and should be dealt with at a more strategic level where it should serve as a guide for decision-making and planning.

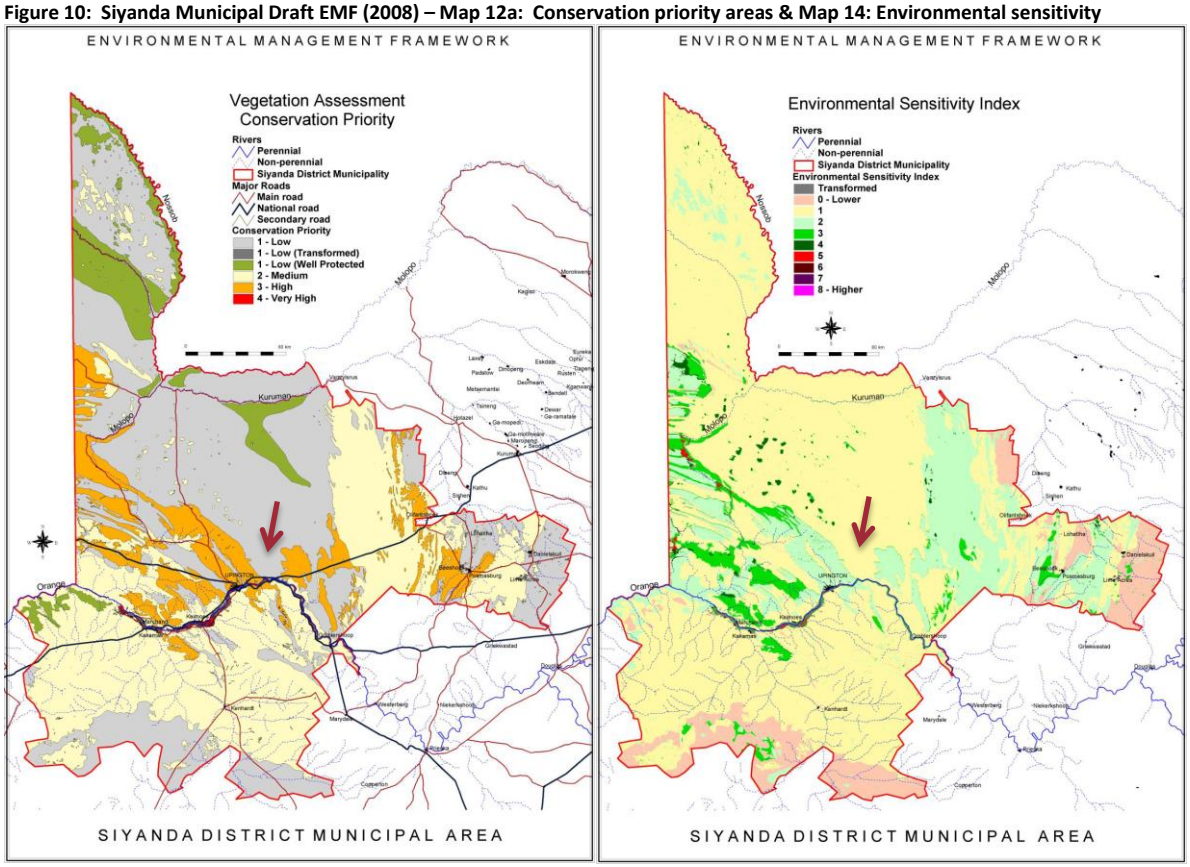
6.7.1 Summary of findings according to the EMF

According to the Siyanda Environmental Management Framework the proposed site falls within the following categories according to the various maps.

Table 3: Siyanda Municipal Draft EMF (2008): Conservation priority classification of the route according to Vegetation type

VEGETATION TYPE	Conservation Priority	Sensitivity index	Control zones
Gordonia Duneveld (SVkd 1)	1 - Low	1 - Low	Zone 2 Potential wind erosion area

Figure 10: Siyanda Municipal Draft EMF (2008) – Map 12a: Conservation priority areas & Map 14: Environmental sensitivity



6.8 VEGETATION ENCOUNTERED

The Kalahari Savanna normally shows very little habitat variation and the vegetation have a low species to area turnover. This means that species composition and richness is fairly similar over most of its extent (Van Rooyen *et al*, 2001). If it is also taken into account that the soils of the Kalahari has limited productive agricultural potential and without access to water only game farming will be possible (Siyanda Draft EMF, 2008). As a result very little intensive agriculture is practiced in the Kalahari and almost 99% of its vegetation types are still in a relative natural state (also the reason almost none of the vegetation types in the Kalahari is considered to be under significant development pressure). However, it is a totally different story with regards to many individual species which were over utilised for their fire-wood-, medical- and fodder potential. As such many Northern Cape plant species are now protected in terms of the National Environmental Management: Biodiversity Act 10 of 2004, the National Forests Act 84 of 1998 and the Northern Cape Nature Conservation Act 9 of 2009. There is thus a great drive in the Northern Cape towards the protection of certain species, which are symbolized by the nationally protected camel thorn- (*Acacia erioloba*) and Sheppard's tree (*Boscia albitrunca*). For more information of these two tree species refer to paragraphs 6.10.2.1 and 6.10.2.2 of this document.

Photo 2: Typical landscape photo looking over the eastern portion of the farm, note *Acacia haematoxylon* trees in foreground

Steenkampspan is covered by broad scale vegetation known as Gordonia Duneveld (Mucina & Rutherford, 2006). Similar to duneveld throughout the Kalahari the vegetation on the farm also show local species composition variations, influenced by local soil condition variations. Rain is the driving force behind the behind the Kalahari ecosystem, with plants and animals responding dramatically. The timing and amount of seasonal rainfall are key factors affecting vegetation dynamics. Perennial plants forms the basis for sustainable food supply in both the wet and dry season, while annual species are regarded as a unreliable luxury, abundant during favourable seasons, but absent during times of drought (Van Rooyen, 2001).

6.8.1 Duneveld

Most of Steenkampspan is covered by dunes and plains on reddish sands (Refer to Photo 3 & Photo 4). The vegetation is mostly shrubby grassland with a sparsely scattered tree over-layer. Visually the landscape is

dominated by the larger trees and shrubs, which consist mainly of *Acacia haematoxylon* and *Boscia albitrunca,* but *Acacia erioloba, Parkinsonia africana, Acacia mellifera, Rhigozum trichotomum* and *Lycium* species are also prominent.

Photo 3: Grassy duneveld with *Acacia haematoxylon*, *Boscia albitrunca* and tall bushman grass, *Stipagrostis amabilis* on dune crests

Dune crests (Refer to Photo 3) are usually dominated by the tall dune bushman grass (*Stipagrostis amabilis*) with the dune bush (*Crotalaria spartioides*) also common. Trees like *Boscia albitrunca* and *Acacia haematoxylon* were often found on dune crests or along the dune slopes, while the shrub *Ehretia rigida* was encountered occasionally. *Acacia erioloba* was less common and mostly associated with deeper sands in the dune straaten. The tsamma melon (*Citrullus lanatus*) and the gemsbok cucumber (*Acanthosicyos naudinianus*) are also expected within the dune landscape.

Photo 4: Sandy plains with *Acacia erioloba* and *Boscia albitrunca* individuals as well *Rhigozum trichotomum* stands in background

Acacia mellifera, in combination with *Boscia albitrunca* and *Parkinsonia africana,* sometimes combines in a dense shrub layer, of up to 2 m, in deeper soils (Refer to Photo 5).

Photo 5: *Acacia mellifera* dominated vegetation on deeper sand soils with *Boscia albitrunca* and *Parkinsonia africana* also present

Rhigozum trichotomum sometimes forms an almost impregnable shrub layer (about 1 m tall) within the inter-dune straaten (Refer to Photo 6).

Photo 6: Dense Driedoring (*Rhigozum trichotomum*) stands in the inter-dune straaten

Other species encountered within the dune vegetation includes: *Aloe claviflora*, *Aptosimum* cf. *marlothii, A. spinescens, Asparagus retrofractus, Barleria rigida, Elephantorrhiza elephantine* (Elands bean)*, Gnidia*

microphylla, Helichrysum cf. *argyrosphaerum, Kleinia longiflora, Lagerra decurrens, Lycium bosciifolium, L. cinereum, L. hirsutum, Parkinsonia africana, Prosopis grandulosa, Salsola* cf. *rabiena*, *Senna italica*, *Sericorema remotiflora, Sutera species*, *Thesium lineatum* and *Zygophyllum pubescens*. Poaceae included: *Centropodia glauca* (Kalahari-Gha grass), *Eragrostis* species, *Stipagrostis amabilis* (bushman dune grass), *S. ciliata,* and *S. uniplumis*

6.8.2 Calcrete outcrops

In the southern half of the property calciferous outcrops was often encountered in the inter-dune straaten or on the plains. Where they are encountered the vegetation composition and structure changes from a grassy shrubland to low shrub dominated vegetation which includes: *Aptosimum albomarginatum, A. spinescens, Barleria rigida* (scorpion thistle)*, Eriocephalus* species, *Lycium bosciifolium, Monechma genistifolium* (perdebos)*, Pteronia* species*, Rhigozum trichotomum* (three thorn)*, Ruschia* cf. *intricata* and *Zygophyllum pubescens*. Only scattered individuals of larger trees of *Acacia erioloba*, *A. haematoxylon*, *Boscia albitrunca* and *Parkinsonia africana* will normally be encountered in these areas, although *Boscia albitrunca* clusters are sometimes encountered on some of these calcrete patches. The grass layer is poorly developed, but still includes *Stipagrostis-*, *Enneapogon-*, *Schmidtia* species and *Fingerhuthia africana*.

Photo 7: Typical vegetation associated with calcrete outcroppings

6.8.3 Rocky outcrop (Inselberg)

One of the interesting features encountered on the farm is the presence of a small granite porphyry outcrop (sometimes referred to as an Inselberg) towards the east of the property (Photo 8). This outcrop was identified as a possible source of crushed stone products needed for road building material. Similar rocky outcrops are found relatively frequently in the vicinity of Upington. An Inselberg is a small, rounded hill, knob, ridge, or mini mountain that rises abruptly from relatively flat surroundings (a German word which literally means “island mountain”). Because of its isolation, harsh edaphic and microclimatic conditions, the vegetation

of inselbergs can differ markedly from those of its surroundings and can represent independent ecosystems or sub-habitats (Kluge & Büdel, 2009). The physical characteristics of such outcrops are likely to provide other habitat conditions not supported by the surrounding flatlands (e.g. protection and breeding areas for birds of prey and reptile species).

Photo 8: Small rocky outcrop encountered on Steenkampspan

Photo 9: Owl chicks encountered on the rocky outcrop

The rocky outcrop encountered on Steenkampspan is very small, and definitely too small to have developed into a separate vegetation type. In fact it only supported grassy species, with *Lycium* species at its base. In terms of vegetation the only feature of note was a number of *Boscia albitrunca* as well as individuals of *Boscia foetida* which grown right next or on top of this little rocky outcrop.

In terms of fauna and avi-fauna, an owl nest was observed on the rocky outcrop, and it is likely to support a number of reptile species like lizards, gecko's and snakes.

6.9 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 4 gives a list of the species encountered on the property. Appendix 1 gives a list of plant species expected in along the route (SANBI, BGIS data).

Table 4: List of species encountered on the sites (excluding grass species)

SPECIES NAME		OCCURRENCE	FAMILY	SANBI / NCNCA / NFA Status
1.	*Acacia erioloba*	Occasionally found throughout the property on deeper sands	FABACEAE	Protected in terms of the NFA
2.	*Acacia haematoxylon*	Common on sandy dunes	FABACEAE	Protected in terms of the NFA
3.	*Acacia mellifera*	Common throughout	FABACEAE	LC
4.	*Acanthosicyos naudinianus*	Occasionally	CUCURBITACEAE	LC
5.	*Aloe claviflora*	Rarely observed	ASPODELACEAE	LC, but all species protected in terms of the NCNCA
6.	*Aptosimum albomarginatum*	Common on calcrete outcrops	SCROPHULAREACEAE	LC
7.	*Aptosimum cf. marlothii*	Commonly found	SCROPHULAREACEAE	LC
8.	*Aptosimum spinescens*	Common throughout	SCROPHULAREACEAE	LC
9.	*Aristida congesta*	Common grass	POACEAE	LC
10.	*Asparagus retrofractus*	Common	ASPARAGACEAE	LC
11.	*Barleria rigida*	Occasionally near calcrete patches	ACANTHACEAE	LC
12.	*Boscia albitrunca*	Very common throughout	CAPPARACEAE	Protected in terms of the NFA
13.	*Boscia foetida*	Occasionally encountered	CAPPARACEAE	Protected in terms of the NCNCA
14.	*Centropodia glauca*	Dominates dune crests	POACEAE	LC
15.	*Citrullus lanatus*	Occasionally	CUCURBITACEAE	LC
16.	*Crotalaria spartioides*	Common on dune crests	FABACEAE	LC
17.	*Cucumis africanus*	Occasionally	CUCURBITACEAE	LC
18.	*Elephantorrhiza elephantine*	Occasionally	FABACEAE	LC
19.	*Eragrostis* species	Common	POACEAE	LC
20.	*Eriocephalus* species	Occasionally at calcrete outcrops	ASTERACEAE	LC
21.	*Fingerhuthia africana*	Common	POACEAE	LC
22.	*Gnidia microphylla*	Common on dunes	THYMELAEACEAE	LC
23.	***Gomphocarpus fruticosus***	Occasionally	APOCYANACEAE	**Weed**
24.	*Helichrysum cf. argyrosphaerum*	Occasionally	ASTERACEAE	LC
25.	*Hermannia tomentosa*	Common on dunes	STERCULIACEAE	LC
26.	*Kleinia longiflora*	Rarely encountered in karroid	ASTERACEAE	LC
27.	*Lagerra decurrens*	Occasionally	ASTERACEAE	LC
28.	*Lycium bosciifolium*	Common throughout	SOLANACEAE	LC
29.	*Lycium cinereum*	Common to karroid	SOLANACEAE	LC
30.	*Lycium hirsutum*	Occasionally in Mekgacha	SOLANACEAE	LC
31.	*Monechma genistifolium*	Commonly found	ACANTHACEAE	LC
32.	*Monechma incanum*	Common at calcrete outcrops	ACANTHACEAE	LC
33.	*Opuntia ficus-indica*	At one of the cattle pens	CACTACEAE	**Category 1 invader**
34.	*Parkinsonia africana*	Commonly found on deeper	FABACEAE	LC

SPECIES NAME		OCCURRENCE	FAMILY	SANBI / NCNCA / NFA Status
		sandy soils		
35.	***Prosopis grandulosa***	Occasionally near water courses	FABACEAE	Category 2 invader
36.	*Pteronia* species	Occasionally	ASTERACEAE	LC
37.	*Rhigozum trichotomum*	Common	BIGNONIACEAE	LC
38.	*Rushia* cf. *intricata*	Common on calcrete outcrops	AIZOACEAE	LC, but all species protected in terms of the NCNCA
39.	*Salsola* cf. *rabiena*	Occasionally throughout	CHENOPODIACEAE	LC
40.	*Salsola kali*	Occasional in disturbed areas	CHENOPODIACEAE	Weed
41.	*Senna italica*	Occasionally throughout	FABACEAE	LC
42.	*Sericorema remotiflora*	Occasionally	AMARANTHACEAE	LC
43.	*Solanum incanum*	Occasionally	SOLANACEAE	LC
44.	*Stipagrostis amabilis*	Dominate dune crests	POACEAE	LC
45.	*Stipagrostis ciliata*	Common if not grazed	POACEAE	LC
46.	*Stipagrostis obtusa*	Common when not grazed	POACEAE	LC
47.	*Sutera* species	Rarely observed	SCROPHULARIACEAE	LC
48.	*Tapinanthus oleifolius*	A parasite on larger trees	LORANTHACEAE	LC
49.	*Thesium lineatum*	Occasionally	SANTALACEAE	LC
50.	*Zygophyllum pubescens*	Occasionally	ZYGOPHYLLACEAE	LC

6.10 SIGNIFICANT AND/OR PROTECTED PLANT SPECIES

South Africa has become the first country to fully assess the status of its entire flora.

6.10.1 Red list of South African Plants

The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (www.redlist.sanbi.org). The table below provides guidelines for specialists on appropriate recommendations for species of conservation concern found on a proposed development site. The recommendations differ depending on both the Red List status of the species, as well as the Red List criteria met.

Table 5: Guidelines for specialists on appropriate recommendations for species of conservation concern (www.redlist.sanbi.org)

STATUS	CRITERION	GUIDELINES FOR RECOMMENDATION
Critically Endangered	PE	No further loss of natural habitat should be permitted as the species is on the brink of extinction, and all other known subpopulations have been lost. The subpopulation in question is likely to be newly discovered and the only remaining subpopulation of this species.
Critically Endangered	A,B,C,D	No further loss of natural habitat should be permitted as the species is on the verge of extinction.
Endangered	B,C,D	No further loss of habitat should be permitted as the species is likely to go extinct in the near future if current pressures continue. All remaining subpopulations have to be conserved if this species is to survive in the long term.
Endangered	Listed under A only	If the species has a restricted range (EOO < 2 000 km^2), recommend no further loss of habitat. If range size is larger, the species is possibly long- lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable, known subpopulation is formally conserved in terms of the National Environmental Management: Protected Areas Act (Act 57 of 2003), and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Vulnerable	D	This species either constitutes less than 1 000 individuals or is known from a very restricted range. No further loss of habitat should be permitted as the species' status will immediately become either Critically Endangered or Endangered, should habitat be lost.
Vulnerable	B,C	The species is approaching extinction but there are still a number of subpopulations in existence. Recommend no further loss of habitat as this will increase the extinction risk of the species.
Vulnerable	Listed under	If the species has a restricted range, EOO < 2 000 km^2, recommend no further loss of habitat. If range size is larger,

STATUS	CRITERION	GUIDELINES FOR RECOMMENDATION
	A only	the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable, known subpopulation is formally conserved in terms of the Protected Areas Act, and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Data Deficient	D	This species is very poorly known, with insufficient information on its habitat, population status or distribution to assess it. However, it is highly likely to be threatened. If a Data Deficient species will be affected by a proposed activity, the subpopulation should be well surveyed and the data sent to the Threatened Species Programme. The species will be reassessed and the new status of the species, with a recommendation, will be provided within a short timeframe.
Data Deficient	T	There is uncertainty regarding the taxonomic status of this species, but it is likely to be threatened. Contact the taxonomist working on this group to resolve its taxonomic status; the species will then be reassessed by the Threatened Species Programme.
Near Threatened	D	Currently known from fewer than 10 locations, therefore preferably recommend no loss of habitat. Should loss of this species' habitat be considered, then an offset that includes conserving another viable subpopulation (in terms of the Protected Areas Act) should be implemented, provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Near Threatened	B,C	The species is approaching thresholds for listing as threatened but there are still a number of subpopulations in existence and therefore there is need to minimise loss of habitat. Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Near Threatened	Listed under A only	If the species has a restricted range, EOO < 2 000 km^2, then recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered. Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant biodiversity conservation plan or (iii) on a site associated with additional ecological sensitivities.
Critically Rare		This is a highly range-restricted species, known from a single site, and therefore no loss of habitat should be permitted as it may lead to extinction of the species. The Threatened Species Programme is not aware of any current threats to this species and should be notified without delay.
Rare		The species is likely to have a restricted range, or be highly habitat specific, or have small numbers of individuals, all of which makes it vulnerable to extinction should it lose habitat. Recommend no loss of habitat. The Threatened Species Programme is not aware of any current threats to this species and should be notified without delay.
Declining		The species is declining but the population has not yet reached a threshold of concern; limited loss of habitat may be permitted. Should the species is known to be used for traditional medicine and if individuals will not be conserved in situ, plants should be rescued and used as mother stock for medicinal plant cultivation programmes.

No species of conservation concern was recorded in terms of the latest Red List of species for South Africa (Refer to Table 4).

6.10.2 Protected species in terms of the NFA

The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species (GN 71 6 of 7 September 2012).

Three (3) species protected in terms of the NFA were encountered namely:

- ***Acacia erioloba (Appendix 2)***
- ***Acacia haematoxylon***
- ***Boscia albitrunca***

Acacia haematoxylon was encountered throughout the property, but was mostly associated with the dunes and inter-dune straaten. Of the three species they were the most abundant. Most of the trees encountered was relatively small (<2 m), but larger individuals was also regularly encountered on deeper sand. Since they were so numerous they were not marked by GPS waypoints. Their numbers and distribution will make it almost impossible to prevent an impact on some of these trees. As such it will be recommended that the final footprint be investigated by a botanist and that application for permits be made for the removal of a number of these species.

Both *Acacia erioloba* and *Boscia albitrunca* (and *Boscia foetida*) individuals were marked by Garmin handheld GPS. A map showing the distribution of these individuals in the respective footprints and the coordinates of these individuals are given in Appendix 2. Please note that this was not done for the whole property, but for all areas likely to be impacted on strength of layout scenarios supplied. Please note that a tree permit will have to be applied for any of these species that might be impacted.

6.10.2.1 *Acacia erioloba* - Camelthorn

The Camelthorn tree exhibits distinctive high quality red heartwood and is a used as a firewood as well as fodder (especially the pods). It holds economic significance in the southern Kalahari region. Camelthorn wood is regarded as the best source of firewood in the region where fuel wood is scarce. As a result this tree has been utilised extensively in the past and is now protected in terms of National Forests Act (GN 716 of 7 September 2012). The slow-growing Camelthorn grows well in poor soils and in harsh environmental conditions, but will take up to 10 years before flowering, and only by age 20, will they produce regular large pod crops (Seymour & Milton, 2003). It is this of great important that mature seed producing individuals are protected. Most benefits brought by *A. erioloba* are not immediately apparent, and it is only when they are large, years after establishment, that they begin to appreciably affect soil quality, produce large patches of shade, and produce pods, gum, and fuel wood. Large trees also diminish nutrient leaching, increase nutrient levels beneath their canopies (owing to nutrient cycling and concentration of livestock dung), mitigate soil degradation, prevent soil erosion on steep slopes, sequester carbon and replenish organic matter. Pod production is linearly related to tree size, so as trees become older, they become more valuable as a source of seed and forage, as livestock relish eating the pods (Seymour and Milton, 2003). In addition, it is often the only available dense shade tree in the hot arid environment of the south-western regions of its distribution.

6.10.2.2 Sheppard's tree

According to Alias & Milton (2003) *Boscia albitrunca* is a keystone species in arid southern Africa, where it primarily provides browse to livestock and game, shade and food and shelter to other animals including invertebrates and birds. The laws of numerous African traditions strictly prohibit destruction of this tree. The wood is not favoured as a fuel wood and has no commercial value, although it is sometimes used in rural areas for making household items such as tables, chairs, spoons and dishes.

This species is under threat, however, owing to intense use of its branches to supplement livestock feed, particularly in times of drought. Its nutritious foliage suggests that this species obtains nutrients from ground water and perhaps also from the concentration of nutrients beneath its canopy because of animal activities. It therefore contributes to nutrient cycling in mainly oligotrophic sands, as well as performing other ecological services such as reducing nutrient leaching, mitigating soil degradation, preventing soil erosion, sequestering carbon and replenishing organic matter.

This species is observed to establish beneath other large trees within its environment, primarily *A. erioloba*, which serve as resting and perch sites for animals and birds, making the species dependent on large tree species in arid savannah. Therefore, threats to species that provide these micro-sites also constitute a threat to *B. albitrunca*. Within the arid Kalahari, indiscriminate removal of Camelthorn (*Acacia erioloba*) trees could reduce the availability of suitable germination sites (Alias & Milton, 2003).

6.10.3 Species protected in terms of the NCNCA

The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, and also 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.

Only three (3) species listed in terms of the NCNCA were encountered along the route. All of these species are considered to be of Least Concern in terms of IUCN status (the International Union for the Conservation of Nature). A flora permit will have to be applied for in terms of the NCNCA if any of these species will be impacted.

6.11 FAUNA AND AVI-FAUNA

Although natural fauna and avi-fauna will still be present, it is expected that it would be limited to mostly avi-fauna, insects and reptile's species. The farm is intensively utilised for stock grazing and very few larger animal species remains (personal observation and personal communication with the land owner). It is also known that one of the requirements of the testing facility would be the absence of any larger animals (for safety reasons). The author thus assumed that all larger mammal species will be removed and actively kept out of the testing facility grounds. Even so, because so few animals were observed, it is not expected that regional or local conservation targets for game or avi-fauna will be significantly adversely affected. However, it is a known

fact that many animal and bird species associate with large *Acacia erioloba* as well as *Boscia albitrunca* trees and the removal of mature trees of these species 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 (Smithers, 1983). Human activity in the area is medium-low and this coupled with hunting and grazing practices has limited the expected species on the property. During the site visit the only antelope species observed were Springbok (*Antidorcas marsupialis*) and Steenbok (*Raphicerus camprestis*) (adjacent picture). According to the land owner, he keeps about 25 Springbok on the property. Kudu (*Tragelaphus strepsiceros*) and Gemsbok (Oryx gazelle) might venture onto the property from time to time, but was not observed. Other mammal species observed (or evidence encountered) included Antbear (*Orycteropus afer*), which is almost exclusively nocturnal, Ground squirrel (*Xerus inaurus*) the Cape hare (*Lepus capensis*) or Shrub hare (*Lepus saxatilis*). Other species not observed, but which are likely to still be encountered in this area includes the Black-backed jackal (*Canis mesomelas*), Bat-eared fox (Octocyon megalotis), the mostly nocturnal Honey badger (*Mellivora capensis*), Ietermagog (*Manis temminckii*), Mongoose, Porcupine (*Hystrix africaeaustralis*), the nocturnal Springhaas (*Pedetes capensis*) and the Suricate (*Suricata suricatta*).

It is expected that all larger antelope (Springbok, Kudu and Gemsbok) will have to be removed. Steenbok are highly territorial and might not pose a big safety risk. Smaller animals and especially the nocturnal animals should also not pose a significant risk (unless night test driving will be done, and in which case a number of the larger animals like porcupine, jackal, and fox etc. might pose a safety hazard).

The proposed activity will result in permanent structures and the physical fencing of the farm Steenkampspan to exclude all larger animals which may pose a safety hazard to the testing facility. Taking the current land use and the size of the property into account the proposed project should still only result in a medium-low impact on mammal species and will not have any significant impact on local or regional conservation targets.

Reptiles: The site falls within the distribution range of approximately 30 reptile species, indicating low diversity. As a result of the open planes on site the reptile composition is likely to be dominated by species which inhabit open areas, such as snakes, lizards, tortoise and geckos. Only lizards and tortoises were observed during the site visit. There are no larger reptiles, which might pose a hazard to the testing

facility, expected on the property (monitors excluded). The removal of the rocky outcrop will certainly impact on a number of species. It is expected that a number of Gecko's, Lizards and snake species might be associated with the rocky outcrop. Removal of the outcrop will have a permanent impact on the habitats associated therewith. Even so, the impact on reptiles is expected to be low and it is considered highly unlikely that it will pose a significant impact on local or regional conservation targets. As a result the impact on reptile species is rated low.

Amphibians: The site falls within the distribution range of approximately 10 amphibian species, but most of these require perennial water for survival and will thus not be affected. No suitable breeding places were observed on the proposed site and it is deemed highly unlikely that the proposed development will have any significant impact on amphibian species.

Avi-fauna: The site falls within the distribution range of approximately 200 bird species known from the broad area. But because of the medium-high human activity it is not expected that a fair representation of these species will be encountered on site or its immediate vicinity. Some of the birds most often seen include, goshawk, black korhaan, fiscal shrike and sandgrouse. No ostriches were observed on the property.

Apart from the possible impact on mature trees the proposed activity is not expected to have a significant impact on avi-fauna. However, it remains important that all larger indigenous trees must be protected wherever possible in order to minimise the possible impact (although localised) on bird species.

6.12 RIVERS AND WETLANDS

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 property falls within the Lower Orange Water Management Area (LOWMA). The LOWMA's natural environment is generally characterised by its arid climate with minimal rainfall and drought conditions. Evaporation (including evapotranspiration) is as high as 3000 mm per annum, which is generally more than the

Mean Annual Rainfall (Siyanda draft EMF, 2008). As a result, little usable surface runoff is generated over most of the area as a result of the extremely low and infrequent rainfall.

No rivers of wetlands were observed on Steenkampspan (based on vegetation delineation). During the November 2014 site visit approximately 34 mm of rain was experienced on the property in an evening thunderstorm. The following day, only one small pool (on a rocky substrate) remains towards the south of the property (See adjacent photo). In terms of vegetation no typical wetland or river riparian vegetation was observed (which would normally indicate areas of regular or prolonged inundations). However, an independent wetland study done by Grundling & Rossouw (2014), for Steenkampspan, showed temporary wetland features can develop (based on landscape positions and soil form). They identified two such temporary wetland areas (Refer to Grundling & Rossouw, 2014). The local and regional importance of these wetlands is not discussed. As a precautionary principle it is recommended that these areas are clearly mapped and taken into account during the lay-out planning. If possible they should be avoided.

One interesting observation was made with regards to a dense linear stand of larger shrub and tree species, which included *Parkinsonia africana*. In the Kalahari, *Parkinsonia africana* is more often than not associated with riparian vegetation. *Acacia erioloba*, which was also encountered in this area, is normally associated with deeper underground water (sometimes very deep). It is known that thunderstorms may result in localised areas of shallow perched water in dune valleys for short periods of time after such storms. The perched water is the result of water seeping readily through the aeolian sand but becomes temporarily trapped on the less permeable calcrete underneath. The occurrence of *Parkinsonia africana* and other trees and shrubs within the dune valley is ascribed to the presence of such a (temporary) perched water table within that dune valley.

Two temporary wetland areas are identified by Grundling & Rossouw (2014). The status of these wetlands is not discussed. In terms of the precautionary principle it is recommended that these wetland areas are not included in the development footprint. If that is not possible the wetland expert should advise on impact minimisation actions.

6.13 INVASIVE ALIEN INFESTATION

Probably because of the harshness of the environment coupled with the dry climate the property shows relatively low alien invasive rates. However, it is alarming that individuals of the alien tree *Prosopis grandulosa* (a category 2 invader) were encountered almost throughout the property (probably distributed by cattle feeding on the pods. At present the infestation rates are still low and it is imperative that an intensive alien removal initiative is established in order to eradicate this species from the property, before it can establish a greater foothold.

All *Prosopis,* individuals and other listed alien invader species encountered must be removed from the property.

7. VELD FIRE RISK

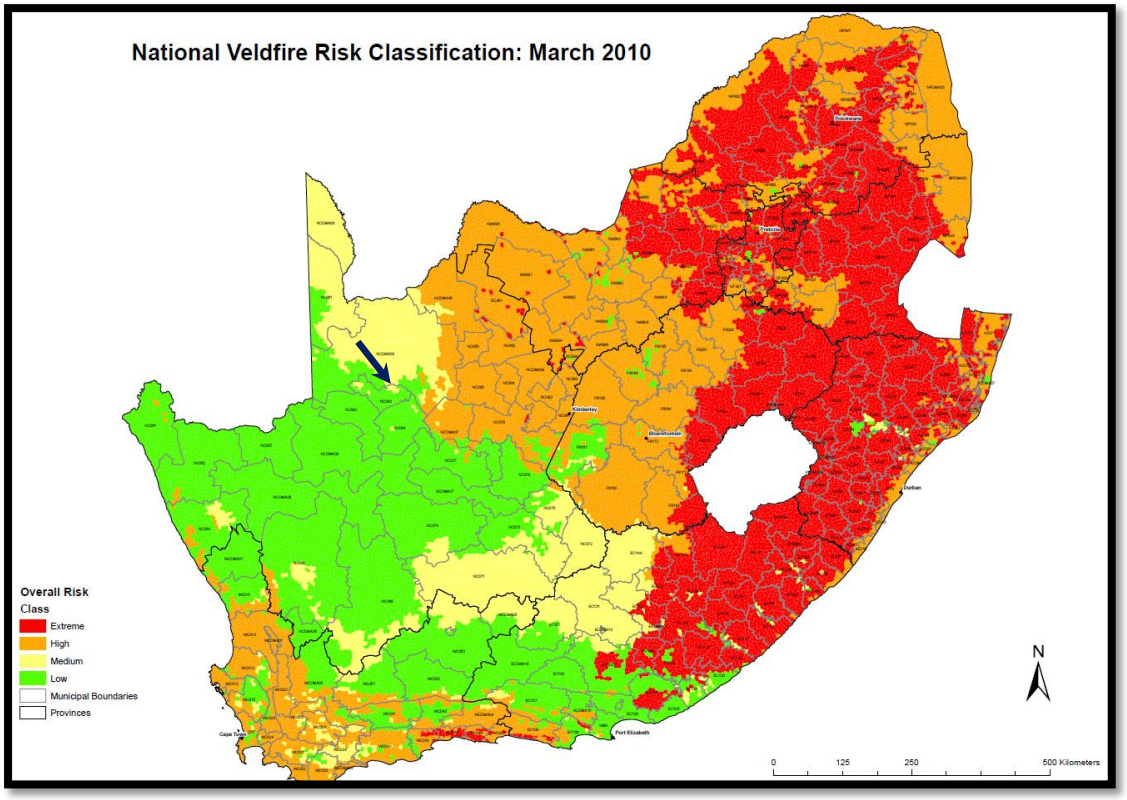
The revised veldfire risk classification (Forsyth, 2010) in terms of the National Veld and Forest Fire Act 101 of 1998 was promulgated in March 2010. The purpose of the revised fire risk classification is to serve as a national framework for implementing the National Veld and Forest Fire Act, and to 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.

Photo 10: Typical fire protection along boundary fence (Neighbouring property)

The proposed Steenkampspan Proving Ground Extension is located in an area supporting mostly a savannah grassland or low shrubland which has been classified with a **medium fire risk classification** (Refer to Figure 11). Although, the fire risk is not high 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.

Photo 10 (above) shows a typical farm boundary road, which also doubles as a fire break. This photo was taken along the north eastern boundary of Steenkampspan showing the neighbouring farmers fire protection measures.

Figure 11: National veldfire risk classification (2010) indicating the location of Steenkampspan



8. 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

8.1 DISCUSSION OF POTENTIAL IMPACTS

The Steenkampspan Proving Ground entails the construction of a high speed oval of 17 km, a handling track of 5.5 km, gravel bad roads of approximately 10 km, access roads and associated infrastructure for the testing of vehicles in hot conditions. Of these structures, only the Oval is of such a size, that it can basically be placed only in one location (with some potential movement to north or south within the property). All other infrastructure can be moved to some degree in order to avoid potential significant environmental aspects. A summary map of potentially significant environmental features is given as Appendix 3.

8.1.1 Potential impact on vegetation type

The vegetation on the property, Gordonia Duneveld, is part of the Savanna Biome. Gordonia Duneveld is classified as “Least Threatened” (thus not under any immediate threat in terms of extinction) with more than 99% of its original extent remaining. However, it must be noted that the conservation target for this vegetation type has not yet been achieved. Gordonia Duneveld has a low species to area ratio (not particularly rich in plant species) and local endemism is very low.

Meaning that the vegetation type is fairly similar over extended areas and it would be unlikely that small localised impacts (like this development) will have a significant impact on national or municipal conservation targets for this vegetation type (or even species).

8.1.2 Potential impact on ecological connectivity

The vegetation is also not fragmented in any way with extended areas of excellent connectivity remaining throughout. The proposed project will lead to some fragmentation on the property itself, but because of the grazing exclusions (safety reasons) the vegetation within the exclusion areas may very well be much better off and will be allowed to return to a more natural state over time. The fragmentation by roads is also not seen as a significant barrier in terms of plant ecology (although it will exclude larger herbivores).

The proposed project is thus very unlikely to result in any significant impact on connectivity with regards to meeting local or national conservation targets.

8.1.3 Potential impact on protected plant species

Although the vegetation type is not regarded as endangered or under pressure, there is a great drive in the Northern Cape towards the protection of endangered and vulnerable species, many of which used to be over-utilised for their fire-wood-, medical- and fodder potential. As such many Northern Cape plant species are now protected in terms of the National Environmental Management: Biodiversity Act 10 of 2004, the National Forests Act 84 of 1998 and the Northern Cape Nature Conservation Act 9 of 2009, symbolized by the nationally protected camel thorn- (*Acacia erioloba*) tree. The most significant feature of the flora encountered on the property is the presence of a large number of full grown indigenous trees (especially protected tree species), which fulfil an important ecological function (micro-climate and habitat) which in turns adds to biodiversity. Of the tree species encountered the most significant species are *Acacia erioloba* (Camelthorn), *Acacia haematoxylon* (grey Camelthorn) and *Boscia albitrunca* (Sheppard's tree). The Northern Cape Nature Conservation Act makes further provisions for the protection of certain species of the Northern Cape (again placing emphasis on the importance of certain species). Three species protected in terms of the NCNCA were encountered of which at least one species (*Boscia foetida*) will be impacted by the proposed development.

The distribution and density of the various protected species means that a number of individuals will be impacted by the proposed development. However, it will be possible to minimise the impact on these species through placement and planning.

- ***Acacia erioloba***: A number of Camelthorn individuals were encountered within or near to the footprint (Refer to Appendix 2) in the areas of deeper sand. Fortunately, the locations of most of these trees are such that it should be relatively easy to evade or minimise impact. The relocation of the bridge area and the reduction of the oval southern turn help enormously to reduce the impact on

the overall number of trees that might be within the footprint. The reduction in the requirement for large open run-off areas adjacent to the high speed oval track will also aid the protection of the Camelthorn and Grey Camelthorn. Seedlings have a low survival rate and the trees have a very slow growth rate, which place emphasis on the protection of healthy seedbearing (mature) individuals. The overall objective must thus be to minimise impact on mature (seed bearing) individuals and that no individual larger than 6 m should be impacted.

- ***Acacia haematoxylon***: The distribution (throughout the property) and numbers of the Grey Camelthorn is such that no matter how the infrastructure is placed it will be almost impossible not to have an impact on quite a number of these trees. Since they are so numerous GPS coordinates of their locations was not taken. Most of the trees are relative small individuals, rarely exceeding 4 m in height. Again they have a low seedling survival rate and slow growth rate. The aim should be to minimise impact on mature trees (wherever possible) and to protect all Grey Camelthorn trees larger than 5 m tall.
- ***Boscia albitrunca***: Large numbers of Sheppard's trees were encountered on the property and like Camelthorn it is mostly associated with deeper sandy soils often associated thick stands of the common small tree or large shrub, *Acacia mellifera* (Blackthorn). In addition it is most often associated with dunes (less common in the inter-dune straaten). It should thus be possible to minimise impact by avoiding the dunes wherever possible, and utilising the inter-dune straaten for the placement of infrastructure. Where dunes have to be crossed it should aim at the shortest route across the dune crest (this will also benefit wind erosion protection – by not exposing dune crests). Again the aim should be to minimise (wherever possible) the impact on mature individuals. Some remarkable specimens were observed on the property.
- ***Boscia foetida***: A few Stink-bushes was also encountered within or near to the development footprint towards the north west of the property. Again the aim should be to minimise the impact on mature individuals, especially older specimens.

8.1.4 Potential impact on critical biodiversity areas

No fine-scale mapping is available for this area and no critical biodiversity areas or biodiversity support areas have been promulgated for this area as yet. A draft Environmental Management Framework (EMF) for the Siyanda District Municipal was published in 2008, and even though not formally approved, the findings were used to guide decisions.

According to the draft EMF Steenkampspan have a **low conservation priority and a low sensitivity index**, but **it is a potential wind erosion area**. Wind erosion will thus have to be addressed during construction.

8.1.5 Potential impact on fauna

Even though not rich in plant species savanna is well known for its richness in animal species, especially mammals. However, Steenkampspan has been intensively used for stock grazing and it is not expected that a fair representation of these species will be encountered. In fact the only antelope observed were Springbok and Steenbok. In terms of this project all larger game species which may hold potential safety risks for high speed track testing will be removed and excluded from the property.

Springbok can be relocated relatively easily, but Steenbok will be less easy to move. They are very territorial and will have to establish a new territory (or fight for new territory). The impact on Springbok is thus not expected to be significant, but it is likely to be severe on the small number of Steenbok on the property. However, in terms of national numbers, the impact on the Steenbok species should be minor.

8.1.6 Potential impact on special habitats

One of the interesting features encountered on the farm is the presence of a small granite porphyry outcrop towards the east of the property. The outcrop is unique in terms of the property but similar and usually larger outcrops are relatively common in the surrounding area (and become more common as one travel more south). The rocky outcrop encountered on Steenkampspan is very small, and definitely too small to have developed a separate vegetation type. It does support a number of *Boscia* species and is expected to support lizards, geckos and snakes species. In addition an owl nest with chicks was observed.

In order to utilise the granite as base material, the outcrop will be mined and the small habitat destroyed. However, it is expected that only a small number of reptile species will be permanently associated with this habitat. As such the impact on local and national conservation targets should be minimal.

8.1.7 Potential impact on water courses or wetlands

No rivers or streams were observed on the property. However, Grundling & Rossouw (2014) identified an area which show temporary wetland features. This area has been identified as a no-go area in planning documents and no further impact is thus expected.

8.1.8 Potential impact of alien infestation

Light infestation by *Prosopis* trees was observed throughout the property. An alien eradication program should be implemented. However, it is very important that the correct alien eradication practices are implemented, as incorrect methods (e.g. mechanical removal, without herbicide application) can led to significant infestation increase, rather than eradication.

8.1.9 *Potential direct impacts*

Direct impacts will be associated with the construction period and also the permanent features (footprint) that will be established. The proposed project will have a localised permanent impact (footprint), but it is unlikely that this footprint will have any significant impact on local or national conservation targets. The potential impact on protected species is much more significant and will have to be managed with care.

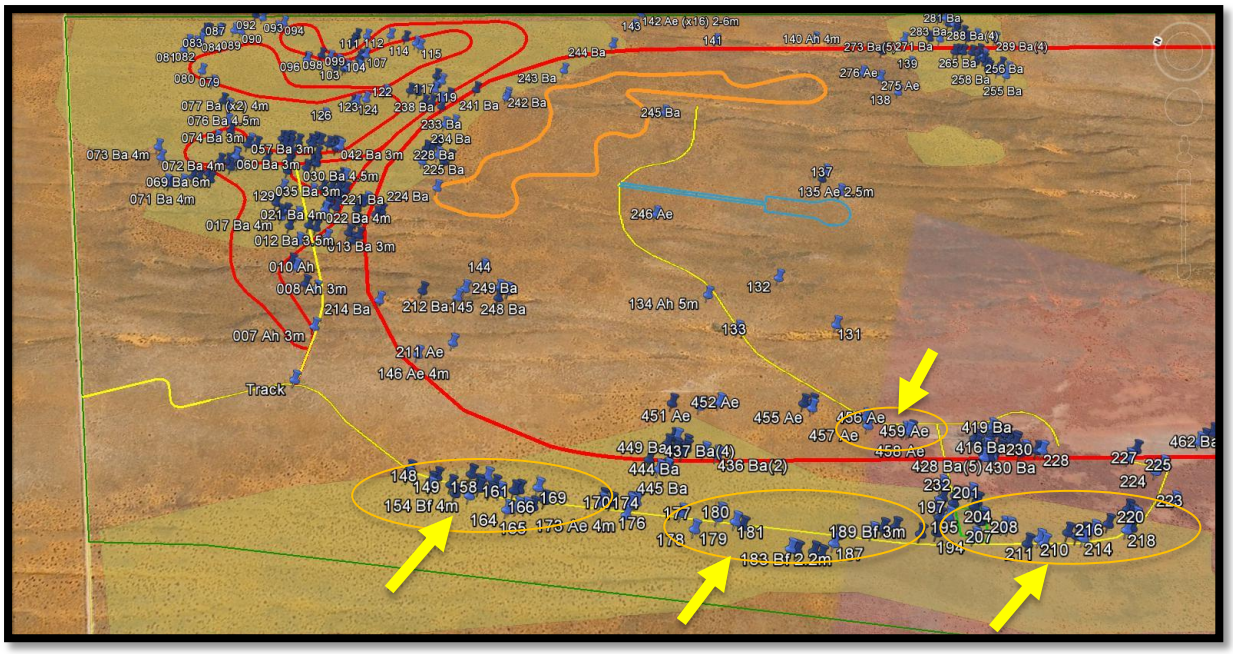
8.2 DISCUSSION OF POTENTIAL IMPACT OF INFRASTRUCTURE

From the above it is clear that the most significant impact from an environmental viewpoint is likely to be associated with the potential impact on protected species (mainly that on protected tree species). With this in mind the proposed infrastructure layout plans are discussed in terms of its potential impact on protected species.

8.2.1 *The access road*

The access route initially runs through *Acacia haematoxylon* veld, and it is very likely that a number of these trees will be impacted. However, it is only once it enters the deeper sands of the dunes to the north west of the property (marked by yellow arrows in Figure 12) when it potentially may impact on a number of *Boscia albitrunca* and *Boscia foetida* and possibly on single individuals of *Acacia erioloba*. However, it is assumed that the entrance road will not be much wider than 10 m in which case it should be relatively simple to place the access routes in such a way as to minimise the impact on these trees.

Figure 12: Google image showing the main access routes (yellow lines) in relation to protected trees encountered (blue markers)

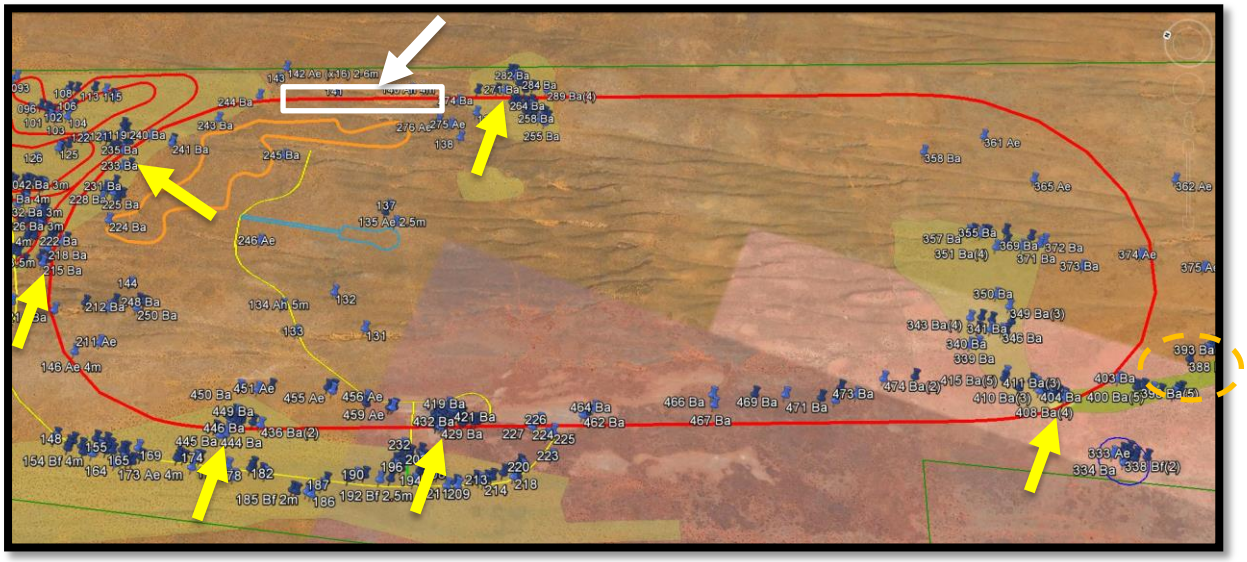


It is recommended that the placement of the access route is micro-managed during construction to minimise the impact on protected species. Micro-management meaning routing the road to avoid mature protected trees wherever possible. This principle has been implemented very successfully on a number of linear projects in the Kalahari.

8.2.2 The oval

The size and design of the oval needs to conform to number engineering requirements and as a result is a very fixed structure with little leeway for adjustment (the property being too small to allow for significant layout alternatives). However, the recent layout changes saw the size of the oval from being reduced from 19 – 17 km). This meant that the southern portion of the oval (orange circle in Figure 13, to the right) will now have a much lower impact on the number of protected trees. The oval potentially will impact on more protected trees in the areas marked by the yellow arrows. But please note that the Figure 13 underneath might give a distorted view of the number of trees that will be impacted. Originally the oval would have had relative large run-off areas (in case of accident), which would have enlarged the footprint significantly. The reduced footprint again will do much to minimise the overall impact. The area marked by the white rectangle is characterized by a layer of calcrete underneath the dunes. It is proposed to excavate into this calcrete layer in order to utilise the calcrete for road building material. However, this will mean the excavations will be deeper in this area and the footprint larger (wider) to accommodate reasonable sloping of the dunes. The placement is fortunate in that it is not associated with dense stands of protected trees.

Figure 13: Google image showing the oval track (Red) in relation to protected trees encountered (blue markers)



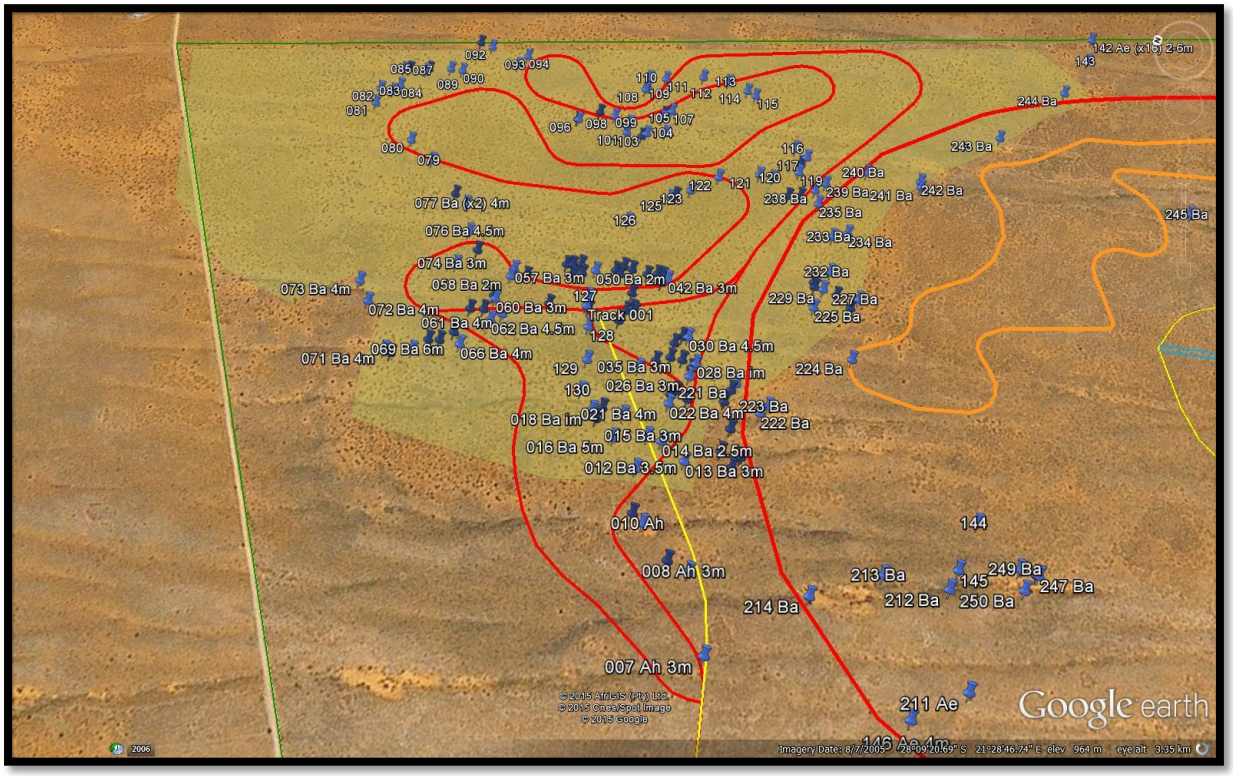
It is recommended that the construction footprint is minimised in the areas associated with dense stands of protected trees (marked by the yellow arrows) in order to minimise the potential impact on such species. Please note that the author do not mean the infrastructure footprint should be narrowed, only the associated construction footprint (which is normally somewhat larger than the actual infrastructure that are to be established.

8.2.3 The bad road tracks

The bad roads will be placed within an area with a relative dense stands of small to medium trees and larger shrubs on deeper red sandy dunes. However, the dominant species encountered in these dunes is the small common tree, *Acacia mellifera*, which can form dense stands dotted with *Boscia albitrunca* (Sheppard's tree).

Although not so evident from Figure 14 is the fact that the Sheppard's trees are mostly associated with the dunes and its foothills and is much less common in the inter-dune straaten.

Figure 14: Google image showing the proposed bad roads (in red), just north of the oval in relation to the protected trees encountered



It is recommended that the bad roads are placed within the inter-dune straaten wherever possible to minimise the potential impact on the protected tree species. This will have the added benefit of also minimising wind erosion potential. Dune crossings should aim at the shortest route over or through the dune and the placement of the road should be micro-managed during layout and construction to further minimise the impact on mature protected species.

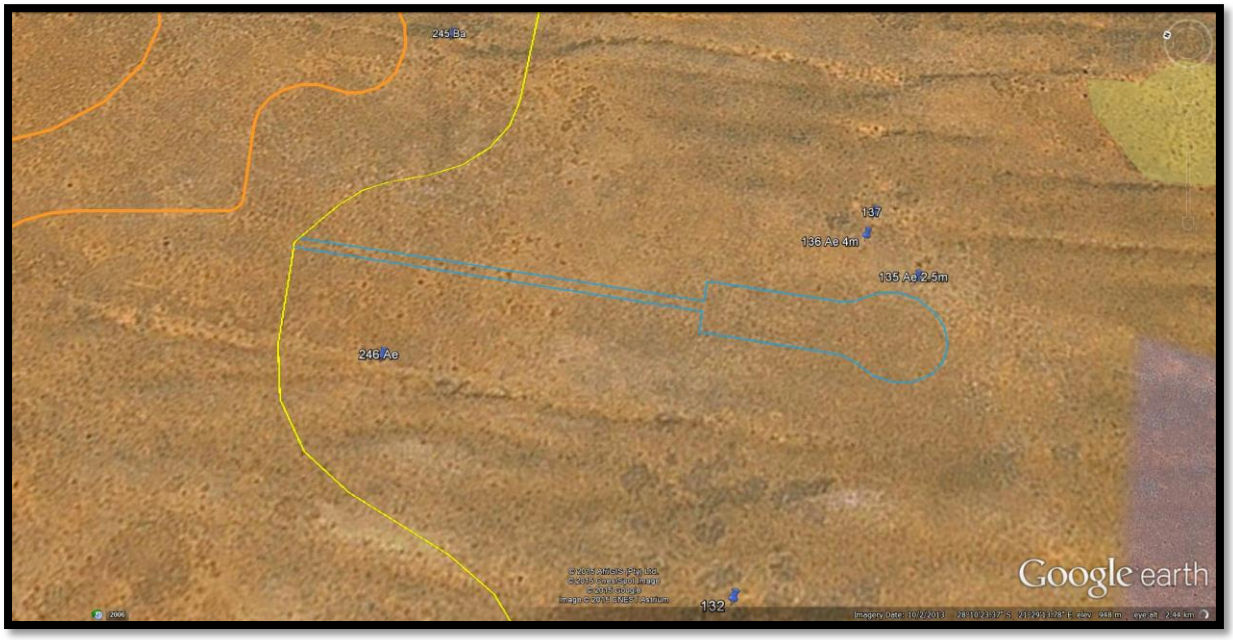
8.2.4 The multifunctional area

The multifunctional area will be located within a large open area between dunes (Figure 15). This vegetation is typical open grassy duneveld dominated by grasses with great number of *Acacia haematoxylon* (Grey Camelthorn) encountered throughout (Refer to Photo 11, adjacent).

Photo 11: Veld in the vicinity of the multifunctional area

The proposed layout will very likely impact on a number of smaller Acacia haematoxylon trees, but will not impact on any Camelthorn or Sheppard's trees.

Figure 15: Google image showing the proposed multifunctional area (in blue) in relation to protected trees encountered (blue markers)



8.2.5 The handling track

The handling track is located in the same inter-dune area as the multifunctional area. Again the impact on protected trees will be very much limited to a number of Acacia haematoxylon (which is very common in this landscape). According to the existing layout one Boscia albitrunca (refer to yellow arrow in Figure 16) may be impacted.

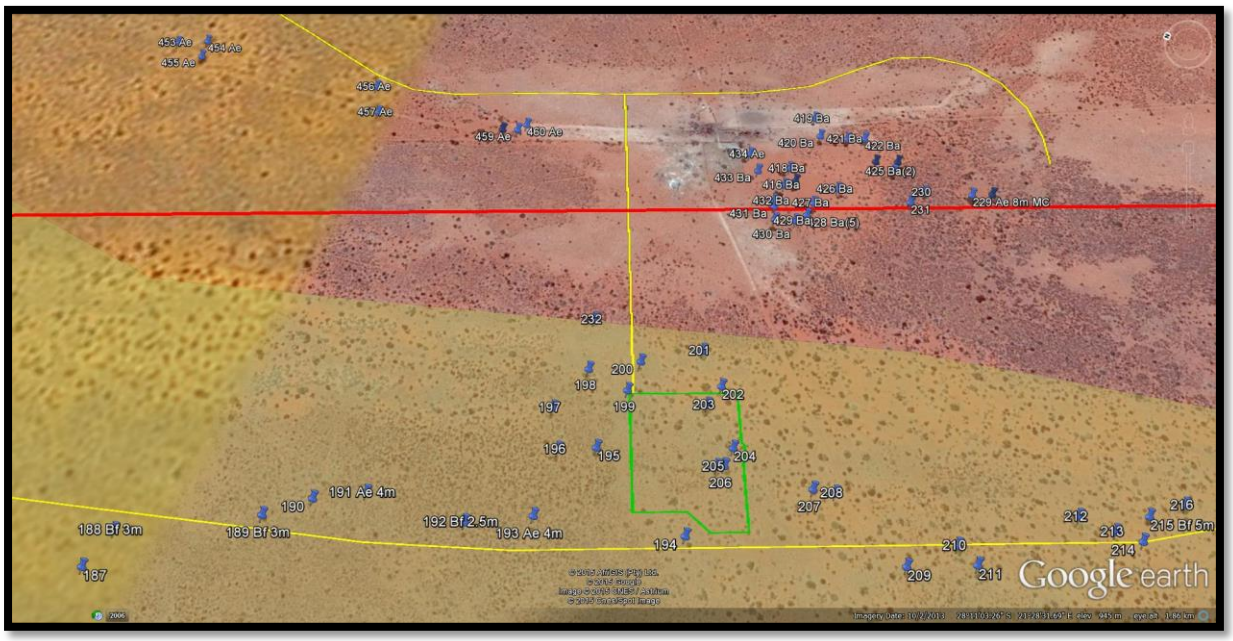
Figure 16: Google image showing the handling track (orange line) in relation to protected trees encountered (blue markers)

It is recommended that (if possible) the track is micro-adjusted in this area to miss the tree.

8.2.6 The building area

Within the proposed footprint for the building area 4 *Boscia albitrunca* individuals were identified. Moving the building area slightly is also not really viable is there are more trees in the adjacent areas (similar distribution). However, the impact can be minimised by incorporating the trees within the building area design (if possible).

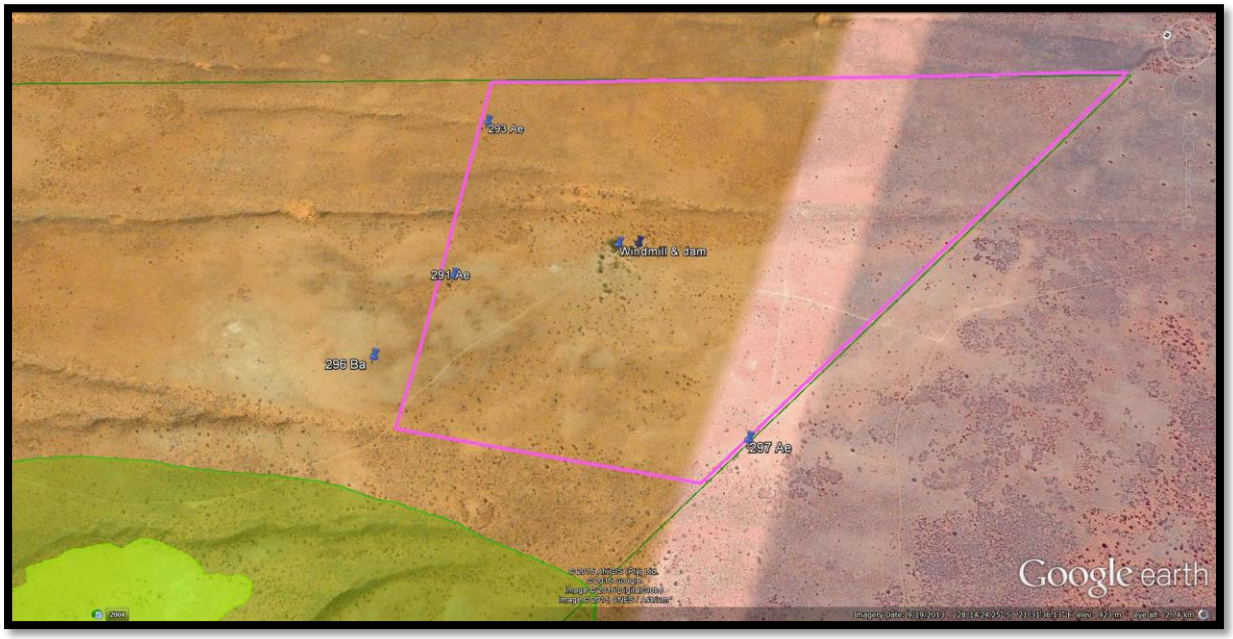
Figure 17: Google image showing the building area (green) and the location of the bridge across the oval in relation to protected trees



It is recommended that the protected trees encountered within the proposed building area are incorporated within the building area layout design (if possible).

8.2.7 The calcrete quarry

Figure 18: Google image of the proposed calcrete quarry (pink) in relation to protected trees encountered.



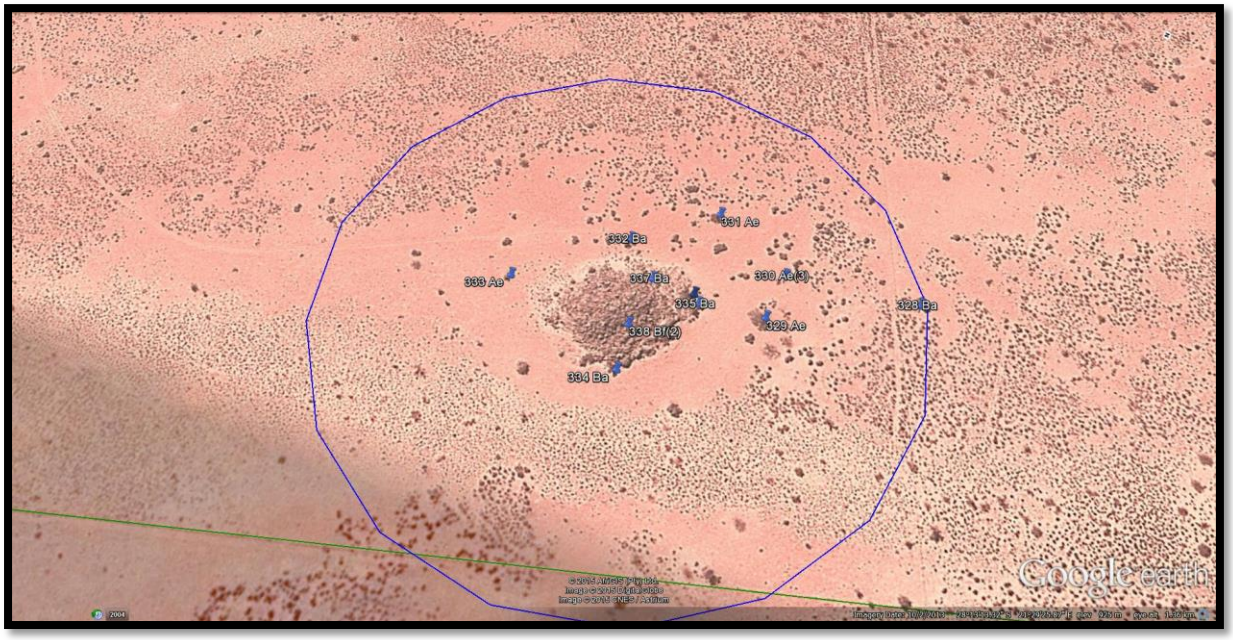
There is a possibility that two Acacia erioloba trees (on the boundary of the site) might be impacted.

It is recommended that these trees be protected if possible and that all mature Camelthorn trees larger than 6 m must be protected.

8.2.8 The granite quarry

Please refer to the impacts associated with the granite quarry discussed under Paragraph 8.1.6. The excavation of the granite outcrop will have a direct impact on 6 medium sized *Acacia erioloba* (Camelthorn), 5 medium sized *Boscia albitrunca* (Sheppard's trees) and two *Boscia foetida* (Stink-bush). There are no mitigating actions possible, apart from reducing the footprint.

Figure 19: Google image of the small rocky outcrop showing the protected trees that will be impacted by the proposed quarry



Please note that apart from the protected tree licence and the flora permit a **fauna permit** will also have to be applied for (possible impact on reptile species).

8.3 EVALUATION OF POTENTIAL ENVIRONMENTAL SIGNIFICANCE

The table underneath gives a summary of biodiversity features encountered during the site visit and a short discussion of their possible significance in terms of regional biodiversity targets.

Table 6: Evaluation of potential impacts (insignificant, low, medium or high)

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING	
Potential impacts on biophysical environment			
Geology & soils	Geology & soils vary only slightly in the larger study area. But a small granite porphyry outcrop (Inselberg) was encountered	In general the geology and soils vary only slightly over most of the site, consisting either of aeolian sands or exposed calciferous material. However, on small granite porphyry outcrop was encountered and was identified as a source of road building material. In terms of geology or vegetation the outcrop is not considered of significant importance, however, it is likely to support a number of reptile and bird species. Mitigation will entail search and rescue of reptile species and timing the work to be outside the breeding season for owls (the bird nesting being most likely the Spotted eagle owl).	
		Without mitigation: Medium	**With mitigation: Medium/Low**
Land use and cover	The proposed footprint will be localised, relatively small and should not lead to long term land-use impacts (apart from the physical footprint)	The area is been utilised mainly for grazing. The impact is considered localised with regards to land use. Mitigation entails keeping the footprint as small as possible and allowing natural process to continue (as much as possible) on the remainder of the property.	
		Without mitigation: Medium/Low	**With mitigation: Low**
Potential impacts on threatened or protected ecosystems			
Vegetation type(s)	Gordonia Duneveld (Least threatened, with more than 99% remaining).	The vegetation type is classified as "Least threatened" and the impact considered localised and relatively small. It is considered unlikely that the proposed project will have any significant impacts on local or regional conservation targets. It might in fact add to regional conservation targets as the remaining natural veld will be protected from stock grazing practices. Mitigation entails keeping the footprint as small as possible and allowing natural process to continue (as much as possible) on the remainder of the property	
		Without mitigation: Low	**With mitigation: Insignificant**
Corridors and conservation priority areas/networks.	Draft Environmental Management Framework (EMF) for the Siyanda District Municipality.	According to the EMF, Gordonia Duneveld has a low conservation priority, and low sensitivity index. However, the soils have a wind erosion potential which will have to be managed. Mitigation will entail minimising the footprint and to ensure erosion control through good rehabilitation. Correct alien eradication will also be important.	
		Without mitigation: Medium/Low	**With mitigation: Low**
Protected plant species	No SA red list species was observed. Three (3) tree species protected in terms of the NFA was encountered. Three (3) plant species protected in terms of the NCNCA was observed.	A great number of trees listed in terms of the NFA trees were encountered within the proposed footprint areas. However, with good mitigation between 90 – 95% of these trees can be conserved. 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. Three species protected in terms of the NCNCA were encountered. Individuals of at least one species will be impacted by the proposed development. Mitigation will 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: High	**With mitigation: Medium/Low**

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING	
Fauna & Avi-fauna	All larger animal species will have to be excluded from the terrain for safety purposes. Also impacts on mature trees and granite outcrop.	Very few larger game species was observed or are expected as a result of the current land use practices (intensive stock grazing) and the impact on larger fauna is thus expected to be low and localised. The removal of larger trees and the granite outcrop will impact on local habitat may impact significantly on regional conservation targets, especially with regards to protected reptile species. Mitigation will entail minimising footprint and the impact on mature indigenous tree species and implementing search and rescue of fauna species during construction.	
		Without mitigation: Medium/High	**With mitigation: Medium/Low**
Rivers & wetlands	No rivers or streams were observed, but two areas that show temporary wetland characteristics were identified (Grundling & Rossouw, 2014)	The project and especially the excavation of road building material have the potential to impact on these wetland features. Mitigation will entail protecting the wetland area and a buffer zone surrounding the wetland area.	
		Without mitigation: Medium/Low	**With mitigation: Insignificant**
Invasive alien infestation	Low, but persistent *Prosopis* infestation was observed throughout the property.	At present the infestation is low, but it is already spread across most of the property and it is vital that the further spreading of this species is stopped as soon as possible. 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: Medium	**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 natural vegetation, which is likely to include protected plant species in terms of the NFA and NCNCA. It will also impact on small wetland areas, a granite outcrop and potentially on fauna and avi-fauna (especially reptile species). However, most of the impacts can be negated and are considered localised. Mitigation will include all the mitigation aspects discussed above.	
		Without mitigation: High	**With mitigation: Medium/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, quarry sites for road building material, 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/High	**With mitigation: Medium/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 might have an impact on protected reptile species). Mitigation will entail excellent environmental control and all of the mitigation measures addressed above.	
		Without mitigation: High	**With mitigation: Medium/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. However, it will ensure that none of the potential impacts above occur.	The loss of full grown protected tree species will be negated. The potential impact on natural fauna will be negated (especially the potential impact on reptile species associated with the rocky outcrop). The potential impact on land-use and wetland areas will be negated. However, it will also mean that a potential source of additional income, not only during construction but also during operation is denied the Municipality. The Northern Cape Municipalities has identified the need for development and tourism as one of the potentially most significant sources of income. The marketing and use of the transportation infrastructure, especially Upington Airport and the major roads, to create a regional and even international hub for imports, exports and cargo handling/distribution is also seen as a potential source of income. The no-go option will mean that these potential economic gains will be lost to the province.

9. 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 NCNCA protected plant species, especially *Boscia foetida* (very localised)
- The potential impact on reptile species as a result of the excavation of the granite outcrop (and associated habitat destruction).

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).

10. MITIGATION RECOMMENDATIONS

10.1 GENERAL

- 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 must be appointed to monitor the construction phase in terms of the EMP and the Biodiversity study recommendations as well as any other conditions pertaining to other specialist studies and requirements of the DENC or DAFF.
- The ECO should give onsite advice with regards to final route layout with the main aim of minimising the impact on protected plant species.
- The construction footprint must always aim at minimum impact.
- Wherever possible, lay-down areas or construction sites should be located within already disturbed areas (e.g. cattle pens) or areas of low ecological value and must be pre-approved by the ECO.
- Indiscriminate clearing of areas must be avoided.
- Topsoil, the top 10-20 cm layer of soil (containing 80-90% of the seed store), must be removed and protected for re-use during rehabilitation.
- During construction the protection of the grassy and shrub ground cover layer is of great importance (since it is this vegetation cover which is responsible for binding the sand of the dunes and thus the main protection against wind erosion). Minimising the footprint is thus of great importance.
- All listed alien invasive plant species must be eradicated from property, with emphasis on *Prosopis* species.
- It is imperative that the correct alien eradication methods are employed (especially with regards to *Prosopis* control) as incorrect methods **WILL** aggravate the infestation.
- An integrated waste management approach must be implemented during construction.
- Construction related waste may only be disposed of at Municipal approved waste disposal sites.

10.2 MITIGATION WITH REGARDS TO PROTECTED TREE SPECIES

The appropriate permit or licence application must be submitted before any construction work may be allowed.

- ***Acacia erioloba***: Seedlings have a low survival rate and the trees have a very slow growth rate, which place emphasis on the protection of healthy seedbearing (mature) individuals. The overall objective must thus be to minimise impact on mature (seed bearing) individuals and no individual larger than 6 m may be removed.
- ***Acacia*** haematoxylon: The distribution (throughout the property) and numbers of the Grey Camelthorn is such that no matter how the infrastructure is placed it will be almost impossible not to have an impact on quite a number of these trees. Most of the trees are relative small individuals, rarely exceeding 4 m in

height. Again they have a low seedling survival rate and slow growth rate. The aim should be to minimise impact on mature trees (wherever possible) and to protect all Grey Camelthorn trees larger than 5 m tall.

- ***Boscia albitrunca***: Large numbers of Sheppard's trees were encountered on the property mostly associated with dunes (being less common in the inter-dune straaten). Inter-dune straaten should thus be preferred for the placement of infrastructure. Where dunes have to be crossed it should aim at the shortest route across the dune crest. The aim of impact minimisation should be to minimise the impact on healthy mature individuals.
- ***Boscia foetida***: A few Stink-bushes was also encountered within or near to the development footprint towards the north west of the property. As with the Sheppard's tree the aim should be to minimise the impact on healthy mature individuals.

10.3 REHABILITATION RECOMMENDATIONS

- During rehabilitation topsoil (and other organic material) must be replaced over the disturbed soil to provide a source of seed and a seed bed to encourage re-growth of plant species.
- Because of the potential impact of wind erosion it is of great importance to ensure that dune crests are suitably stabilised as part of the rehabilitation process.
- Both *Acacia mellifera* and *Rhigozum trichotomum* branches have been used with great success for dune stabilization on similar projects in the Kalahari (Photo 12, underneath). However, Acacia mellifera will last much longer and should thus be preferred as stabilization material.
- Crushed calcrete is also used very successfully to stabilise dunes, and can be another method of ensuring dune stabilisation.
- All efforts should be made to rehabilitate quarry sites.

Photo 12: Example of Acacia mellifera and Rhigozum trichotomum branches uses for dune stabilisation

- Follow up work must be carried out after rehabilitation to ensure that no invasive alien plant re-establishes itself.

10.4 OTHER LEGISLATION

- An **application must be made for a tree permit in terms of the NFA** with regards to the impact on protected tree species.
- An **application for a flora permit must be submitted in terms of Schedule 1 and 2 of the NCNCA** with regards to the impact on protected plant species.
- An **application for a fauna (Catch & Release) permit must be submitted in terms of Schedule 1 and 2 of the NCNCA** with regards to the impact on protected reptile species applicable to the removal of the rocky outcrop.
- **A mining permit must be obtained from the Department of Mineral Resources** with regards to the excavation of road building material.
- **Water Use Authorization** in terms of the NWA (National Water Act). Existing registered water uses must be evaluated against the proposed uses. Any additional uses must be registered.

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APPENDIX 1: BGIS REFERENCE SPECIES LIST (FLORA & FAUNA)

SCIENTIFIC NAME	*FAMILY*	CATEGORY
FABACEAE	*Acacia karroo*	Plants
FABACEAE	*Acacia mellifera* subsp*. detinens*	Plants
ACANTHACEAE	*Acanthopsis hoffmannseggiana*	Plants
PASSIFLORACEAE	*Adenia repanda*	Plants
APOCYNACEAE	*Adenium oleifolium*	Plants
AIZOACEAE	*Aizoon asbestinum*	Plants
AIZOACEAE	*Aizoon schellenbergii*	Plants
ASPHODELACEAE	*Aloe claviflora*	Plants
ASPHODELACEAE	*Aloe* sp*.*	Plants
AMARANTHACEAE	*Amaranthus praetermissus*	Plants
AMARANTHACEAE	*Amaranthus thunbergii*	Plants
FABACEAE	*Amphithalea williamsonii*	Plants
POACEAE	*Anthephora pubescens*	Plants
SCROPHULARIACEAE	*Aptosimum albomarginatum*	Plants
SCROPHULARIACEAE	*Aptosimum elongatum*	Plants
SCROPHULARIACEAE	*Aptosimum lineare var. lineare*	Plants
SCROPHULARIACEAE	*Aptosimum procumbens*	Plants
SCROPHULARIACEAE	*Aptosimum spinescens*	Plants
ASTERACEAE	*Arctotis virgata*	Plants
FABACEAE	*Argyrolobium harveyanum*	Plants
POACEAE	*Aristida adscensionis*	Plants
POACEAE	*Aristida congesta subsp. barbicollis*	Plants
FABACEAE	*Aspalathus subtingens*	Plants
FABACEAE	*Aspalathus tridentata* subsp*. staurantha*	Plants
ACANTHACEAE	*Barleria lichtensteiniana*	Plants
ACANTHACEAE	*Barleria rigida*	Plants
ACANTHACEAE	*Blepharis mitrata*	Plants
AMARYLLIDACEAE	*Boophone disticha*	Plants
CAPPARACEAE	*Boscia foetida* subsp*. foetida*	Plants
ASTERACEAE	*Brachylaena ilicifolia*	Plants
BUDDLEJACEAE	*Buddleja saligna*	Plants
CAPPARACEAE	*Cadaba aphylla*	Plants
POACEAE	*Cenchrus ciliaris*	Plants
APOCYNACEAE	*Ceropegia* sp*.*	Plants
VERBENACEAE	*Chascanum cuneifolium*	Plants
ASTERACEAE	*Cineraria geraniifolia*	Plants
ASTERACEAE	*Cineraria saxifraga*	Plants
MENISPERMACEAE	*Cissampelos capensis*	Plants
ROSACEAE	*Cliffortia linearifolia*	Plants
ROSACEAE	*Cliffortia serpyllifolia*	Plants

SCIENTIFIC NAME	*FAMILY*	CATEGORY
CUCURBITACEAE	*Coccinia rehmannii*	Plants
ASTERACEAE	*Cotula sericea*	Plants
CRASSULACEAE	*Cotyledon orbiculata* var. *orbiculata*	Plants
ASTERACEAE	*Dicoma capensis*	Plants
IRIDACEAE	*Dierama pulcherrimum*	Plants
ASTERACEAE	*Dimorphotheca cuneata*	Plants
ASTERACEAE	*Dimorphotheca sinuata*	Plants
ASTERACEAE	*Dimorphotheca zeyheri*	Plants
HYACINTHACEAE	*Dipcadi crispum*	Plants
FABACEAE	*Dipogon lignosus*	Plants
BORAGINACEAE	*Ehretia rigida* subsp. *rigida*	Plants
POACEAE	*Enneapogon desvauxii*	Plants
POACEAE	*Enneapogon scaber*	Plants
POACEAE	*Eragrostis annulata*	Plants
POACEAE	*Eragrostis echinochloidea*	Plants
POACEAE	*Eragrostis porosa*	Plants
POACEAE	*Eragrostis* sp.	Plants
ASTERACEAE	*Eriocephalus ambiguus*	Plants
ASTERACEAE	*Eriocephalus microphyllus* var. *pubescens*	Plants
EBENACEAE	*Euclea undulata*	Plants
EUPHORBIACEAE	*Euphorbia avasmontana* var. *sagittaria*	Plants
EUPHORBIACEAE	*Euphorbia gariepina subsp. balsamea*	Plants
EUPHORBIACEAE	*Euphorbia glanduligera*	Plants
EUPHORBIACEAE	*Euphorbia inaequilatera* var. *inaequilatera*	Plants
EUPHORBIACEAE	*Euphorbia mauritanica* var. *mauritanica*	Plants
EUPHORBIACEAE	*Euphorbia spinea*	Plants
ASTERACEAE	*Euryops brachypodus*	Plants
ASTERACEAE	*Felicia echinata*	Plants
ASTERACEAE	*Felicia filifolia* subsp. *filifolia*	Plants
ASTERACEAE	*Felicia hirta*	Plants
ASTERACEAE	*Felicia muricata* subsp. *muricata*	Plants
ASTERACEAE	*Felicia ovata*	Plants
POACEAE	*Fingerhuthia africana*	Plants
ASTERACEAE	*Foveolina dichotoma*	Plants
ASTERACEAE	*Gazania leiopoda*	Plants
ASTERACEAE	*Geigeria ornativa*	Plants
GISEKIACEAE	*Gisekia pharnacioides* var. *pharnacioides*	Plants
ASTERACEAE	*Gnaphalium capense*	Plants
ASTERACEAE	*Gnaphalium vestitum*	Plants
THYMELAEACEAE	*Gnidia burchellii*	Plants

SCIENTIFIC NAME	*FAMILY*	CATEGORY
THYMELAEACEAE	*Gnidia nana*	Plants
THYMELAEACEAE	*Gnidia* sp.	Plants
NEURADACEAE	*Grielum humifusum var. humifusum*	Plants
ASTERACEAE	*Gymnostephium ciliare*	Plants
PEDALIACEAE	*Harpagophytum procumbens* subsp. *procumbens*	Plants
ASTERACEAE	*Helichrysum* sp.	Plants
BORAGINACEAE	*Heliotropium ciliatum*	Plants
MALVACEAE	*Hermannia abrotanoides*	Plants
MALVACEAE	*Hermannia erodioides*	Plants
MALVACEAE	*Hermannia flammea*	Plants
MALVACEAE	*Hermannia gracilis*	Plants
MALVACEAE	*Hermannia modesta*	Plants
MALVACEAE	*Hermannia mucronulata*	Plants
MALVACEAE	*Hermannia salviifolia var. grandistipula*	Plants
MALVACEAE	*Hermannia* sp.	Plants
MALVACEAE	*Hermannia spinosa*	Plants
ORCHIDACEAE	*Holothrix burchellii*	Plants
APOCYNACEAE	*Hoodia gordonii*	Plants
APOCYNACEAE	*Huernia hystrix* subsp. *hystrix*	Plants
OROBANCHACEAE	*Hyobanche sanguinea*	Plants
FABACEAE	*Indigofera alternans* var. *alternans*	Plants
FABACEAE	*Indigofera angustata*	Plants
FABACEAE	*Indigofera auricoma*	Plants
FABACEAE	*Indigofera heterotricha*	Plants
FABACEAE	*Indigofera zeyheri*	Plants
SCROPHULARIACEAE	*Jamesbrittenia atropurpurea* subsp. *pubescens*	Plants
ASTERACEAE	*Kleinia longiflora*	Plants
RUBIACEAE	*Kohautia caespitosa* subsp. *brachyloba*	Plants
IRIDACEAE	*Lapeirousia littoralis* subsp. *littoralis*	Plants
BORAGINACEAE	*Lappula heteracantha*	Plants
PROTEACEAE	*Leucadendron rubrum*	Plants
AMARANTHACEAE	*Leucosphaera bainesii*	Plants
ASTERACEAE	*Leysera tenella*	Plants
MOLLUGINACEAE	*Limeum aethiopicum* subsp. *aethiopicum* var. *aethiopicum*	Plants
MOLLUGINACEAE	*Limeum myosotis* var. *confusum*	Plants
MESEMBRYANTHEMACEAE	*Lithops bromfieldii*	Plants
SOLANACEAE	*Lycium oxycarpum*	Plants
ASTERACEAE	*Matricaria sp.*	Plants
POACEAE	*Merxmuellera* sp.	Plants
ASTERACEAE	*Metalasia pulcherrima* forma *pulcherrima*	Plants

SCIENTIFIC NAME	*FAMILY*	CATEGORY
MOLLUGINACEAE	*Mollugo cerviana* var. *cerviana*	Plants
ACANTHACEAE	*Monechma divaricatum*	Plants
ACANTHACEAE	*Monechma incanum*	Plants
ACANTHACEAE	*Monechma spartioides*	Plants
GERANIACEAE	*Monsonia burkeana*	Plants
GERANIACEAE	*Monsonia umbellata*	Plants
RUBIACEAE	*Nenax microphylla*	Plants
ASTERACEAE	*Nidorella auriculata*	Plants
ASTERACEAE	*Nidorella* sp.	Plants
MELIACEAE	*Nymania capensis*	Plants
OCHNACEAE	*Ochna arborea* var. *arborea*	Plants
OLEACEAE	*Olea capensis* subsp. *capensis*	Plants
APOCYNACEAE	*Orbea variegata*	Plants
HYACINTHACEAE	*Ornithogalum tenuifolium* subsp. *tenuifolium*	Plants
ASTERACEAE	*Osteospermum grandidentatum*	Plants
ASTERACEAE	*Osteospermum imbricatum* subsp. *nervatum* var. *nervatum*	Plants
ASTERACEAE	*Osteospermum junceum*	Plants
ASTERACEAE	*Othonna eriocarpa*	Plants
ASTERACEAE	*Othonna ramulosa*	Plants
OXALIDACEAE	*Oxalis bowiei*	Plants
OXALIDACEAE	*Oxalis imbricata* var. *violacea*	Plants
FABACEAE	*Parkinsonia africana*	Plants
RUBIACEAE	*Pavetta capensis* subsp. *capensis*	Plants
ASTERACEAE	*Pegolettia retrofracta*	Plants
GERANIACEAE	*Pelargonium anethifolium*	Plants
GERANIACEAE	*Pelargonium inquinans*	Plants
GERANIACEAE	*Pelargonium reniforme* subsp. *reniforme*	Plants
ASTERACEAE	*Pentzia dentata*	Plants
ASTERACEAE	*Pentzia incana*	Plants
ASTERACEAE	*Pentzia pinnatisecta*	Plants
ASTERACEAE	*Pentzia spinescens*	Plants
ACANTHACEAE	*Peristrophe cernua*	Plants
POLYGONACEAE	*Persicaria attenuata* subsp. *africana*	Plants
NYCTAGINACEAE	*Phaeoptilum spinosum*	Plants
RHAMNACEAE	*Phylica* sp.	Plants
PHYLLANTHACEAE	*Phyllanthus incurvus*	Plants
PHYLLANTHACEAE	*Phyllanthus maderaspatensis*	Plants
PLANTAGINACEAE	*Plantago* sp.	Plants
POLYGALACEAE	*Polygala seminuda*	Plants
FABACEAE	*Pomaria lactea*	Plants

SCIENTIFIC NAME	*FAMILY*	CATEGORY
PORTULACACEAE	*Portulaca quadrifida*	Plants
FABACEAE	*Prosopis glandulosa* var. *glandulosa*	Plants
FABACEAE	*Prosopis velutina*	Plants
ASTERACEAE	*Pteronia teretifolia*	Plants
ASTERACEAE	*Pteronia unguiculata*	Plants
FABACEAE	*Ptycholobium biflorum* subsp. *biflorum*	Plants
MALVACEAE	*Radyera urens*	Plants
BIGNONIACEAE	*Rhigozum obovatum*	Plants
BIGNONIACEAE	*Rhigozum trichotomum*	Plants
CHENOPODIACEAE	*Salsola glabrescens*	Plants
DIPSACACEAE	*Scabiosa angustiloba*	Plants
POACEAE	*Schmidtia kalahariensis*	Plants
ASTERACEAE	*Senecio asperulus*	Plants
ASTERACEAE	*Senecio erubescens* var. *erubescens*	Plants
ASTERACEAE	*Senecio hastatus*	Plants
ASTERACEAE	*Senecio juniperinus* var. *juniperinus*	Plants
ASTERACEAE	*Senecio macroglossus*	Plants
ASTERACEAE	*Senecio monticola*	Plants
ASTERACEAE	*Senecio othonniflorus*	Plants
ASTERACEAE	*Senecio puberulus*	Plants
ASTERACEAE	*Senecio radicans*	Plants
ASTERACEAE	*Senecio retrorsus*	Plants
ASTERACEAE	*Senecio sophioides*	Plants
ASTERACEAE	*Senecio* sp.	Plants
AMARANTHACEAE	*Sericocoma avolans*	Plants
PEDALIACEAE	*Sesamum capense*	Plants
POACEAE	*Setaria verticillata*	Plants
SOLANACEAE	*Solanum capense*	Plants
SOLANACEAE	*Solanum nigrum*	Plants
POACEAE	*Stipagrostis anomala*	Plants
POACEAE	*Stipagrostis ciliata* var. *capensis*	Plants
POACEAE	*Stipagrostis obtusa*	Plants
POACEAE	*Stipagrostis uniplumis* var. *neesii*	Plants
POACEAE	*Stipagrostis uniplumis* var. *uniplumis*	Plants
GESNERIACEAE	*Streptocarpus* sp.	Plants
THYMELAEACEAE	*Struthiola argentea*	Plants
PORTULACACEAE	*Talinum arnotii*	Plants
LORANTHACEAE	*Tapinanthus oleifolius*	Plants
ASTERACEAE	*Tarchonanthus camphoratus*	Plants
ASTERACEAE	*Tarchonanthus littoralis*	Plants

SCIENTIFIC NAME	*FAMILY*	CATEGORY
FABACEAE	*Tephrosia angulata*	Plants
FABACEAE	*Tephrosia capensis var. capensis*	Plants
FABACEAE	*Tephrosia dregeana var. dregeana*	Plants
FABACEAE	*Tephrosia grandiflora*	Plants
AIZOACEAE	*Tetragonia saligna*	Plants
SANTALACEAE	*Thesium gnidiaceum var. gnidiaceum*	Plants
POACEAE	*Tragus berteronianus*	Plants
AIZOACEAE	*Trianthema parvifolia var. parvifolia*	Plants
MALPIGHIACEAE	*Triaspis hypericoides subsp. nelsonii*	Plants
ZYGOPHYLLACEAE	*Tribulus zeyheri subsp. zeyheri*	Plants
IRIDACEAE	*Tritonia strictifolia*	Plants
CAMPANULACEAE	*Wahlenbergia capillacea subsp. capillacea*	Plants
CAMPANULACEAE	*Wahlenbergia tenella var. tenella*	Plants
ZYGOPHYLLACEAE	*Zygophyllum dregeanum*	Plants
ZYGOPHYLLACEAE	*Zygophyllum flexuosum*	Plants
ZYGOPHYLLACEAE	*Zygophyllum lichtensteinianum*	Plants
ZYGOPHYLLACEAE	*Zygophyllum rigidum*	Plants

SCIENTIFIC NAME	*FAMILY*	COMMON NAME	CATEGORY
APIDAE	*Thyreus brachyaspis*	Insect (Bee)	Animals
APIDAE	*Thyreus calceatus*	Insect (Bee)	Animals
ATRACTASPIDIDAE	*Xenocalamus bicolor*	Quill-snouted snake	Animals
BAETIDAE	*Centroptilum sp.*	Insect (Mayfly)	Animals
BAETIDAE	*Pseudocloeon magae*	Insect (Mayfly)	Animals
BRACONIDAE	*Iphiaulax dodsi*	Insect	Animals
BUPRESTIDAE	*Ptosima sexmaculata*	Insect (Beetle)	Animals
BUPRESTIDAE	*Sphenoptera vinosa*	Insect (Beetle)	Animals
CAENIDAE	*Unidentified Caenidae*	Insect (Mayfly)	Animals
CARABIDAE	*Geobaenus ingenuus*	Insect (Beetle)	Animals
CARABIDAE	*Macrocheilus hybridus*	Insect (Beetle)	Animals
CARABIDAE	*Phloeozetus cordiger*	Insect (Beetle)	Animals
CARABIDAE	*Scarites sexualis*	Insect (Beetle)	Animals
CARABIDAE	*Trechodes babaulti*	Insect (Beetle)	Animals
CHRYSOPIDAE	*Italochrysa gigantia*	Insect	Animals
CLARIIDAE	*Clarias gariepinus*	African sharp tooth catfish	Animals
COLUBRIDAE	*Dasypeltis scabra*	Egg-eating snake	Animals
COLUBRIDAE	*Dipsina multimaculata*	Dwarf beaked snake	Animals
COLUBRIDAE	*Lycophidion capense*	Cape wolf snake	Animals
CORDYLIDAE	*Cordylus polyzonus*	Karoo girdled lizard	Animals
CURCULIONIDAE	*Hipporhinus subvittatus var.*		Animals

SCIENTIFIC NAME	*FAMILY*	COMMON NAME	CATEGORY
	cinerascens		
DIAPRIIDAE	*Ferrieropria*	Insect (Fly)	Animals
EUCOILIDAE	*Gronotoma nitida*	Insect (Fly)	Animals
GEKKONIDAE	*Chondrodactylus angulifer*	Comb-toed gecko	Animals
GEKKONIDAE	*Pachydactylus capensis*	Thick-toed gecko	Animals
GEKKONIDAE	*Ptenopus garrulus*	Winged foot gecko	Animals
GNAPHOSIDAE	*Zelotes cronwrighti*	Insect (Spider)	Animals
GNAPHOSIDAE	*Zelotes gooldi*	Insect (Spider)	Animals
GYRINIDAE	*Aulonogyrus alternatus*	Insect (Beetle)	Animals
HESPERIIDAE	*Pyrgus fritillarius fritillum*	Insect (Butterfly)	Animals
HISTERIDAE	*Saprinus pseudocyaneus*	Insect (Beetle)	Animals
ICHNEUMONIDAE	*Paracollyria*	Insect (Wasp)	Animals
LACERTIDAE	*Pedioplanis undata*	Sand Lizard	Animals
LEPTOCERIDAE	*Leptecho sp.*	Insect	Animals
LEPTOCERIDAE	*Oecetis sp.*	Insect	Animals
LEPTOCERIDAE	*Unidentified Leptoceridae*	Insect	Animals
LYCAENIDAE	*Aloeides damarensis damarensis*	Insect (Butterfly)	Animals
LYCAENIDAE	*Aloeides simplex*	Insect (Butterfly)	Animals
LYCAENIDAE	*Cigaritis namaqua*	Insect (Butterfly)	Animals
LYCAENIDAE	*Cigaritis phanes*	Insect (Butterfly)	Animals
LYCAENIDAE	*Iolaus (Stugeta) subinfuscata reynoldsi*	Insect (Butterfly)	Animals
LYCAENIDAE	*Stugeta bowkeri subsp. bowkeri*	Insect (Butterfly)	Animals
LYCAENIDAE	*Stugeta subinfuscata subsp. reynoldsi*	Insect (Butterfly)	Animals
LYCOSIDAE	*Lycosa cretata*	Insect (Spider)	Animals
MEGACHILIDAE	*Fidelia braunsiana*	Insect (Bee)	Animals
MELITTIDAE	*Meganomia binghami*	Insect (Bee)	Animals
MUSCIDAE	*Unidentified Muscidae*		Animals
NAUCORIDAE	*Laccocoris sp.*	Insect	Animals
NYMPHALIDAE	*Acraea stenobea*	Insect (Butterfly)	Animals
NYMPHALIDAE	*Neptis jordani*	Insect (Butterfly)	Animals
NYMPHALIDAE	*Tarsocera namaquensis*	Insect (Butterfly)	Animals
PAMPHAGIDAE	*Transvaaliana draconis*	Insect	Animals
PERLIDAE	*Neoperla transvaalensis*	Insect	Animals
PIERIDAE	*Colotis agoye agoye*	Insect (Butterfly)	Animals
PIERIDAE	*Colotis agoye bowkeri*	Insect (Butterfly)	Animals
PIERIDAE	*Colotis euippe subsp. mediata*	Insect (Butterfly)	Animals
PLUMARIIDAE	*Myrmecopterina minor*	Insect (Wasp)	Animals
PTEROMALIDAE	*Mesopolobus fasciiventris*	Insect (Wasp)	Animals
RANIDAE	*Unidentified Ranidae*		Animals

SCIENTIFIC NAME	*FAMILY*	COMMON NAME	CATEGORY
SALTICIDAE	*Festicula australis*		Animals
SALTICIDAE	*Menemerus rubicundus*	Jumping spider	Animals
SCARABAEIDAE	*Liatongus quadripunctatus*	Insect	Animals
SCARABAEIDAE	*Onitis confusus*	Insect	Animals
SCARABAEIDAE	*Onthophagus orthocerus*	Insect	Animals
SCARABAEIDAE	*Oocamenta rufiventris*	Insect	Animals
SILPHIDAE	*Silpha (Silpha) peringueyi*	Beetle	Animals
SIMULIIDAE	*Simulium bovis*	Insect	Animals
SOLPUGIDAE	*Solpuguna collinita*	Arachnida (Spider)	Animals
SPHECIDAE	*Laphyragogus pictus*	Wasp	Animals
STAPHYLINIDAE	*Zyras (Camonia) conifera*	Insect	Animals
STENOPELMATIDAE	*Sia (Maxentius) pallidus*	Insect	Animals
TABANIDAE	*Mesomyia (Perisilvius) redunda*	Insect	Animals
TABANIDAE	*Mesomyia(Mesomyia) costata*	Insect	Animals
TENEBRIONIDAE	*Eutrapela bicolor*	Insect	Animals
TENEBRIONIDAE	*Strongylium perturbator*	Insect	Animals
TETRAGNATHIDAE	*Nephila inaurata*	Golden orb-weaver spider	Animals
TYPHLOPIDAE	*Typhlops sp.*		Animals
Unidentified TRICHOPTERA	*Unidentified Trichoptera*		Animals
VIPERIDAE	*Bitis caudalis*	Horned adder	Animals

APPENDIX 2: PROTECTED TREE SPECIES ENCOUNTERED

Waypoint	GPS Coordinates	Altitude
007 Ah 3m	S28.15999 E21.47317	956 m
008 Ah 3m	S28.15908 E21.47506	960 m
009 Ae 4.5m	S28.15855 E21.47515	959 m
010 Ah	S28.15774 E21.47586	964 m
011 Ba 4m	S28.15743 E21.47604	962 m
012 Ba 3.5m	S28.15710 E21.47729	961 m
013 Ba 3m	S28.15809 E21.47795	960 m
014 Ba 2.5m	S28.15741 E21.47831	962 m
015 Ba 3m	S28.15706 E21.47832	963 m
016 Ba 5m	S28.15633 E21.47795	962 m
017 Ba 4m	S28.15574 E21.47832	963 m
018 Ba im	S28.15556 E21.47854	965 m
019 Ba 3m	S28.15577 E21.47871	964 m
021 Ba 4m	S28.15631 E21.47871	964 m
022 Ba 4m	S28.15722 E21.47950	963 m
023 Ba 3m	S28.15717 E21.47980	963 m
024 Ba 3m	S28.15726 E21.47996	962 m
025 Ba 3.5m	S28.15760 E21.47981	962 m
026 Ba 3m	S28.15743 E21.48055	961 m
027 Ba 2m	S28.15739 E21.48083	960 m
028 Ba im	S28.15746 E21.48102	961 m
029 Ba im	S28.15711 E21.48100	960 m
030 Ba 4.5m	S28.15702 E21.48180	961 m
031 Ba 3m	S28.15688 E21.48175	961 m
032 Ba 3m	S28.15676 E21.48146	961 m
033 Ba 2.5m	S28.15681 E21.48096	961 m
034 Ba 2.7m	S28.15651 E21.48070	961 m
035 Ba 3m	S28.15618 E21.48031	962 m
036 Ba 4m	S28.15521 E21.48161	966 m
037 Ba 2.2m	S28.15528 E21.48204	964 m
038 Ba 4m	S28.15548 E21.48207	963 m
039 Ba 4m	S28.15540 E21.48217	962 m
040 Ba (x2) 3m	S28.15522 E21.48269	961 m
041 Ba 2.5m	S28.15581 E21.48337	960 m
042 Ba 3m	S28.15591 E21.48356	960 m
043 Ba 3m	S28.15575 E21.48365	960 m
044 Ba 3.5m	S28.15561 E21.48364	962 m
045 Ba 4m	S28.15537 E21.48351	962 m
046 Ba 2.5m	S28.15494 E21.48352	963 m
047 Ba 2.5m	S28.15471 E21.48354	963 m
048 Ba 4.5m	S28.15470 E21.48322	964 m
049 Ba 2m	S28.15455 E21.48330	964 m
050 Ba 2m	S28.15406 E21.48307	966 m

Waypoint	GPS Coordinates	Altitude
051 Ba 3.5m	S28.15377 E21.48284	965 m
052 Ba 3m	S28.15363 E21.48315	964 m
053 Ba 3m	S28.15343 E21.48304	964 m
054 Ba 3.5m	S28.15328 E21.48297	964 m
055 Ba 3.5m	S28.15357 E21.48267	963 m
056 Ba 3m	S28.15244 E21.48214	966 m
057 Ba 3m	S28.15206 E21.48223	966 m
058 Ba 2m	S28.15208 E21.48194	967 m
059 Ba 2.2m	S28.15193 E21.48111	970 m
060 Ba 3m	S28.15201 E21.48101	970 m
061 Ba 4m	S28.15238 E21.48058	972 m
062 Ba 4.5m	S28.15218 E21.48026	972 m
063 Ba 2.5m	S28.15187 E21.48054	972 m
064 Ba 3.5m	S28.15155 E21.48041	973 m
065 Ba 5m	S28.15149 E21.47949	971 m
066 Ba 4m	S28.15178 E21.47917	973 m
067 Ba 6m	S28.15126 E21.47909	972 m
068 Ba 2.5m	S28.15099 E21.47899	972 m
069 Ba 6m	S28.15076 E21.47850	972 m
070 Ba 6m	S28.15030 E21.47818	969 m
071 Ba 4m	S28.15011 E21.47823	970 m
072 Ba 4m	S28.14900 E21.47958	968 m
073 Ba 4m	S28.14849 E21.48017	968 m
074 Ba 3m	S28.15057 E21.48178	968 m
075 Ba 3m	S28.15089 E21.48250	966 m
076 Ba 4.5m	S28.15040 E21.48306	966 m
077 Ba (x2) 4m	S28.14990 E21.48405	969 m
078 Ba 3.5	S28.14947 E21.48429	970 m
79	S28.14830 E21.48533	970 m
80	S28.14738 E21.48590	969 m
81	S28.14570 E21.48703	970 m
82	S28.14554 E21.48770	970 m
83	S28.14595 E21.48775	970 m
84	S28.14602 E21.48809	970 m
85	S28.14581 E21.48886	971 m
86	S28.14594 E21.48896	971 m
87	S28.14644 E21.48908	970 m
88	S28.14649 E21.48920	970 m
89	S28.14711 E21.48947	969 m
90	S28.14746 E21.48953	969 m
91	S28.14745 E21.49106	970 m
92	S28.14786 E21.49100	969 m
93	S28.14892 E21.49050	967 m

Waypoint	GPS Coordinates	Altitude
94	S28.14904 E21.49103	965 m
95	S28.15148 E21.48881	962 m
96	S28.15151 E21.48881	960 m
97	S28.15198 E21.48940	959 m
98	S28.15245 E21.48939	959 m
99	S28.15295 E21.48927	958 m
100	S28.15291 E21.48912	959 m
101	S28.15300 E21.48883	960 m
102	S28.15347 E21.48885	960 m
103	S28.15356 E21.48901	961 m
104	S28.15406 E21.48925	959 m
105	S28.15377 E21.48987	959 m
106	S28.15377 E21.49008	959 m
107	S28.15393 E21.49029	960 m
108	S28.15290 E21.49096	961 m
109	S28.15289 E21.49114	962 m
110	S28.15283 E21.49155	963 m
111	S28.15330 E21.49171	964 m
112	S28.15433 E21.49225	963 m
113	S28.15510 E21.49236	962 m
114	S28.15574 E21.49216	960 m
115	S28.15603 E21.49203	958 m
116	S28.15774 E21.49015	955 m
117	S28.15813 E21.48990	954 m
118	S28.15803 E21.48956	953 m
119	S28.15808 E21.48918	953 m
120	S28.15746 E21.48864	954 m
121	S28.15707 E21.48861	955 m
122	S28.15603 E21.48802	958 m
123	S28.15546 E21.48716	960 m
124	S28.15513 E21.48681	961 m
125	S28.15503 E21.48664	961 m
126	S28.15424 E21.48527	961 m
127	S28.15421 E21.48210	960 m
128	S28.15457 E21.48108	959 m
129	S28.15491 E21.48002	960 m
130	S28.15512 E21.47901	961 m
131	S28.17886 E21.48168	943 m
132	S28.17611 E21.48334	946 m
133	S28.17536 E21.47984	946 m
134 Ah 5m	S28.17373 E21.48123	945 m
135 Ae 2.5m	S28.17721 E21.48972	941 m
136 Ae 4m	S28.17631 E21.49026	943 m

Waypoint	GPS Coordinates	Altitude
137	S28.17632 E21.49077	944 m
138	S28.17814 E21.49792	950 m
139	S28.17826 E21.50037	954 m
140 Ah 4m	S28.17353 E21.50057	954 m
141	S28.16911 E21.49845	956 m
142 Ae (x16) 2-6m	S28.16502 E21.49914	957 m
143	S28.16506 E21.49795	959 m
144	S28.16479 E21.47900	955 m
145	S28.16460 E21.47754	959 m
146 Ae 4m	S28.16433 E21.47348	953 m
147 Ae (x6) 4m	S28.16640 E21.46822	951 m
148	S28.16646 E21.46794	952 m
149	S28.16741 E21.46781	952 m
150 Bf 4m	S28.16732 E21.46806	951 m
151 Bf 4m	S28.16744 E21.46833	950 m
152	S28.16804 E21.46821	951 m
153	S28.16832 E21.46791	951 m
154 Bf 4m	S28.16882 E21.46804	951 m
155	S28.16901 E21.46849	950 m
156	S28.16890 E21.46863	950 m
157	S28.16851 E21.46894	949 m
158	S28.16909 E21.46906	950 m
159	S28.16946 E21.46885	951 m
160	S28.16942 E21.46850	950 m
161	S28.16974 E21.46863	950 m
162 Ae 6m	S28.17019 E21.46889	950 m
163	S28.17035 E21.46899	950 m
164	S28.17028 E21.46800	951 m
165	S28.17056 E21.46825	952 m
166	S28.17083 E21.46836	952 m
167	S28.17106 E21.46851	951 m
168	S28.17134 E21.46893	951 m
169	S28.17092 E21.46936	950 m
170	S28.17320 E21.46964	949 m
171	S28.17318 E21.46984	949 m
172	S28.17351 E21.46980	950 m
173 Ae 4m	S28.17419 E21.46947	948 m
174	S28.17413 E21.47002	949 m
175	S28.17414 E21.47008	949 m
176	S28.17433 E21.47015	949 m
177	S28.17594 E21.47033	947 m
178	S28.17656 E21.46986	947 m
179	S28.17715 E21.47067	947 m

Waypoint	GPS Coordinates	Altitude
180	S28.17716 E21.47092	946 m
181	S28.17777 E21.47076	947 m
182	S28.17806 E21.47067	947 m
183 Bf 2.2m	S28.17982 E21.47042	947 m
184 Bf 2.2m	S28.18004 E21.47042	947 m
185 Bf 2m	S28.18058 E21.47062	946 m
186	S28.18084 E21.47058	946 m
187	S28.18114 E21.47126	944 m
188 Bf 3m	S28.18120 E21.47165	943 m
189 Bf 3m	S28.18224 E21.47228	943 m
190	S28.18256 E21.47259	943 m
191 Ae 4m	S28.18294 E21.47282	943 m
192 Bf 2.5m	S28.18381 E21.47290	942 m
193 Ae 4m	S28.18431 E21.47318	942 m
194	S28.18553 E21.47351	940 m
195	S28.18458 E21.47403	942 m
196	S28.18428 E21.47388	942 m
197	S28.18409 E21.47426	942 m
198	S28.18424 E21.47479	942 m
199	S28.18463 E21.47471	941 m
200	S28.18464 E21.47506	943 m
201	S28.18512 E21.47541	943 m
202	S28.18539 E21.47509	942 m
203	S28.18533 E21.47485	942 m
204	S28.18566 E21.47450	941 m
205	S28.18559 E21.47427	941 m
206	S28.18564 E21.47430	942 m
207	S28.18640 E21.47438	942 m
208	S28.18658 E21.47442	942 m
209	S28.18727 E21.47397	941 m
210	S28.18762 E21.47433	942 m
211	S28.18780 E21.47422	942 m
211 Ae	S28.16533 E21.47460	948 m
212	S28.18850 E21.47502	942 m
212 Ba	S28.16451 E21.47696	955 m
213	S28.18880 E21.47499	943 m
213 Ba	S28.16308 E21.47672	957 m
214	S28.18901 E21.47499	943 m
214 Ba	S28.16170 E21.47553	957 m
215 Ba	S28.15917 E21.47824	959 m
215 Bf 5m	S28.18904 E21.47526	943 m
216	S28.18930 E21.47549	942 m
216 Ba	S28.15881 E21.47860	961 m

Waypoint	GPS Coordinates	Altitude
217 Ba	S28.15928 E21.47862	960 m
217 Bf (x2) 4m	S28.18975 E21.47598	942 m
218	S28.19037 E21.47597	942 m
218 Ba	S28.15883 E21.47935	960 m
219 Ba	S28.15845 E21.48011	960 m
219 Bf 3m	S28.19053 E21.47615	941 m
220	S28.19059 E21.47667	942 m
220 Ba	S28.15851 E21.48054	959 m
221	S28.19045 E21.47675	942 m
221 Ba	S28.15857 E21.48080	959 m
222	S28.19032 E21.47692	940 m
222 Ba	S28.15936 E21.48011	958 m
223	S28.19180 E21.47797	940 m
223 Ba	S28.15949 E21.48040	958 m
224	S28.19109 E21.47910	939 m
224 Ba	S28.16103 E21.48276	960 m
225	S28.19130 E21.47951	940 m
225 Ba	S28.15972 E21.48413	959 m
226	S28.19036 E21.47988	941 m
226 Ba	S28.16061 E21.48451	958 m
227	S28.19014 E21.47936	941 m
227 Ba	S28.16074 E21.48491	958 m
228	S28.18721 E21.47845	938 m
228 Ba	S28.16016 E21.48482	958 m
229 Ae 8m MC	S28.18702 E21.47836	938 m
229 Ba	S28.15979 E21.48489	959 m
230	S28.18658 E21.47820	939 m
230 Ba	S28.15956 E21.48489	960 m
231	S28.18648 E21.47801	939 m
231 Ba	S28.15950 E21.48504	960 m
232	S28.18410 E21.47534	941 m
232 Ba	S28.15982 E21.48561	958 m
233	S34.20648 E19.08874	246 m
233 Ba	S28.15956 E21.48697	958 m
234 Ba	S28.15991 E21.48728	958 m
235 Ba	S28.15889 E21.48812	958 m
236 Ba	S28.15835 E21.48824	960 m
237 Ba	S28.15804 E21.48809	959 m
238 Ba	S28.15868 E21.48862	960 m
239 Ba	S28.15888 E21.48903	959 m
240 Ba	S28.15986 E21.48999	957 m
241 Ba	S28.16139 E21.49000	955 m
242 Ba	S28.16134 E21.49023	956 m

Waypoint	GPS Coordinates	Altitude
243 Ba	S28.16311 E21.49310	955 m
244 Ba	S28.16459 E21.49604	954 m
245 Ba	S28.16850 E21.49194	951 m
246 Ae	S28.17030 E21.48504	947 m
247 Ba	S28.16627 E21.47812	950 m
248 Ba	S28.16622 E21.47811	950 m
249 Ba	S28.16585 E21.47812	950 m
250 Ba	S28.16604 E21.47760	952 m
255 Ba	S28.18263 E21.50141	943 m
256 Ba	S28.18262 E21.50199	942 m
257 Ba	S28.18228 E21.50223	944 m
258 Ba	S28.18220 E21.50153	944 m
259 Ba	S28.18177 E21.50146	945 m
260 Ba	S28.18177 E21.50172	945 m
261 Ba	S28.18162 E21.50191	946 m
262 Ba	S28.18111 E21.50189	947 m
263 Ba	S28.18144 E21.50224	947 m
264 Ba	S28.18128 E21.50236	947 m
265 Ba	S28.18140 E21.50257	946 m
266 Ba	S28.18112 E21.50286	948 m
267 Ba	S28.18081 E21.50257	949 m
268 Ba(15)	S28.18043 E21.50245	948 m
269 Ba	S28.18020 E21.50236	949 m
270 Ba	S28.18003 E21.50226	949 m
271 Ba	S28.17919 E21.50305	952 m
272 Ba(5)	S28.17873 E21.50292	951 m
273 Ba(5)	S28.17757 E21.50232	951 m
274 Ba	S28.17678 E21.50088	950 m
275 Ae	S28.17715 E21.49870	947 m
276 Ae	S28.17627 E21.49874	946 m
280 Ba	S28.17883 E21.50491	951 m
281 Ba	S28.17912 E21.50502	952 m
282 Ba	S28.17936 E21.50456	953 m
283 Ba	S28.17961 E21.50465	952 m
284 Ba	S28.17981 E21.50454	953 m
285 Ba	S28.17979 E21.50408	953 m
286 Ba(2)	S28.18015 E21.50412	953 m
287 Ba(2)	S28.18041 E21.50370	954 m
288 Ba(4)	S28.18078 E21.50412	953 m
289 Ba(4)	S28.18169 E21.50427	949 m
291 Ae	S28.23704 E21.52634	923 m
293 Ae	S28.23610 E21.53036	925 m
296 Ba	S28.23646 E21.52402	927 m

Waypoint	GPS Coordinates	Altitude
297 Ae	S28.24309 E21.52504	920 m
299 Ae	S28.23855 E21.51721	920 m
300 Ae(4)	S28.23844 E21.51731	921 m
301 Ba	S28.23802 E21.51860	920 m
302 Ba	S28.23765 E21.51735	919 m
304 Ba	S28.23507 E21.50615	923 m
305 Ba	S28.23524 E21.50591	919 m
306 Ba	S28.23501 E21.50579	919 m
307 Ba	S28.23493 E21.50565	920 m
308 Ae+Ba	S28.23432 E21.50555	919 m
309 Ba	S28.23416 E21.50564	922 m
310 Ba	S28.23385 E21.50472	920 m
311 Ba	S28.23368 E21.50438	920 m
312 Ba(5)	S28.23358 E21.50388	919 m
313 Ba	S28.23291 E21.50390	921 m
314 Ba (5)	S28.23281 E21.50330	920 m
316 Ba(6)	S28.23268 E21.50238	920 m
317 Ba(5)	S28.23149 E21.50252	920 m
318 Ba	S28.23094 E21.50145	920 m
319 Ba(3)	S28.22981 E21.49991	923 m
320 Ba	S28.22909 E21.49965	924 m
321 Ba	S28.22950 E21.49926	924 m
322 Ba(2)	S28.22983 E21.49860	920 m
323 Ba(3)	S28.22981 E21.49761	918 m
324 Ba	S28.22921 E21.49704	919 m
325 Ba	S28.22899 E21.49665	917 m
326 Ba	S28.22877 E21.49562	917 m
327 Ba(2)	S28.22816 E21.49539	919 m
328 Ba	S28.22161 E21.49111	921 m
329 Ae	S28.22099 E21.49076	922 m
330 Ae(3)	S28.22101 E21.49103	922 m
331 Ae	S28.22064 E21.49127	921 m
332 Ba	S28.22030 E21.49096	921 m
333 Ae	S28.21987 E21.49055	923 m
334 Ba	S28.22048 E21.49024	923 m
335 Ba	S28.22070 E21.49072	924 m
336 Ba	S28.22066 E21.49077	923 m
337 Ba	S28.22047 E21.49078	925 m
338 Bf(2)	S28.22045 E21.49049	930 m
339 Ba	S28.21170 E21.49504	925 m
340 Ba	S28.21130 E21.49475	927 m
341 Ba	S28.21220 E21.49633	926 m
342 Ba	S28.21151 E21.49608	926 m

Waypoint	GPS Coordinates	Altitude
343 Ba(4)	S28.21095 E21.49670	926 m
344 Ba(4)	S28.21154 E21.49702	927 m
345 Ba	S28.21213 E21.49708	928 m
346 Ba	S28.21281 E21.49650	926 m
347 Ba(2)	S28.21307 E21.49661	926 m
348 Ba(4)	S28.21322 E21.49747	927 m
349 Ba(3)	S28.21290 E21.49850	925 m
350 Ba	S28.21206 E21.49905	926 m
351 Ba(4)	S28.21139 E21.50273	923 m
353 Ba	S28.21068 E21.50372	929 m
354 Ba	S28.21046 E21.50366	929 m
355 Ba	S28.21034 E21.50343	929 m
356 Ba	S28.20988 E21.50348	928 m
357 Ba	S28.20962 E21.50325	929 m
358 Ba	S28.20574 E21.50881	931 m
361 Ae	S28.20901 E21.51178	928 m
362 Ae	S28.22077 E21.51288	920 m
363 Ae	S28.22429 E21.51031	923 m
365 Ae	S28.21259 E21.50927	929 m
367 Ba	S28.21171 E21.50427	931 m
368 Ba	S28.21191 E21.50351	928 m
369 Ba	S28.21284 E21.50343	927 m
370 Ba	S28.21321 E21.50441	926 m
371 Ba	S28.21378 E21.50406	927 m
372 Ba	S28.21400 E21.50444	927 m
373 Ba	S28.21644 E21.50331	927 m
374 Ae	S28.21954 E21.50566	926 m
375 Ae	S28.22314 E21.50616	925 m
376 Ae	S28.22500 E21.50535	925 m
377 Ae	S28.22525 E21.50500	925 m
378 Ae	S28.22569 E21.50447	924 m
380 Ba	S28.22799 E21.50219	926 m
381 Ba	S28.22722 E21.50107	928 m
382 Ba	S28.22671 E21.50096	929 m
383 Ba	S28.22645 E21.50068	929 m
384 Ba	S28.22592 E21.50043	928 m
385 Ba	S28.22593 E21.50004	927 m
386 Ba	S28.22557 E21.49960	926 m
387 Ba	S28.22536 E21.49974	927 m
388 Ba(5)	S28.22477 E21.49897	927 m
389 Ba	S28.22469 E21.49997	929 m
390 Ba	S28.22443 E21.50031	930 m
391 Ba	S28.22426 E21.50039	928 m

Waypoint	GPS Coordinates	Altitude
392 Ba	S28.22411 E21.50057	929 m
393 Ba(5)	S28.22385 E21.49986	927 m
394 Ba(12)	S28.22306 E21.49890	929 m
395 Ba(5)	S28.22282 E21.49653	929 m
396 Ae	S28.22263 E21.49634	930 m
397 Ae	S28.22260 E21.49616	930 m
398 Ba(5)	S28.22247 E21.49597	930 m
399 Ba	S28.22178 E21.49587	929 m
400 Ba(5)	S28.22136 E21.49582	929 m
401 Ba	S28.22085 E21.49584	930 m
402 Ba(3)	S28.22049 E21.49564	929 m
403 Ba	S28.21949 E21.49578	929 m
404 Ba	S28.21687 E21.49321	930 m
405 Ba	S28.21679 E21.49338	930 m
406 Ba	S28.21646 E21.49345	931 m
407 Ba	S28.21625 E21.49312	930 m
408 Ba(4)	S28.21601 E21.49294	930 m
409 Ba(4)	S28.21574 E21.49335	931 m
410 Ba(3)	S28.21550 E21.49316	931 m
411 Ba(3)	S28.21523 E21.49354	932 m
412 Ba(4)	S28.21498 E21.49365	932 m
413 Ba(3)	S28.21440 E21.49289	929 m
414 Ba	S28.21352 E21.49318	930 m
415 Ba(5)	S28.21354 E21.49359	931 m
416 Ba	S28.18527 E21.47772	942 m
417 Ba	S28.18536 E21.47782	942 m
418 Ba	S28.18527 E21.47797	942 m
419 Ba	S28.18532 E21.47879	941 m
420 Ba	S28.18544 E21.47856	941 m
421 Ba	S28.18570 E21.47864	941 m
422 Ba	S28.18586 E21.47871	941 m
423 Ba	S28.18604 E21.47843	941 m
424 Ba	S28.18625 E21.47852	941 m
425 Ba(2)	S28.18624 E21.47837	941 m
426 Ba	S28.18578 E21.47789	942 m
427 Ba	S28.18560 E21.47760	942 m
428 Ba(5)	S28.18558 E21.47742	942 m
429 Ba	S28.18549 E21.47729	942 m
430 Ba	S28.18530 E21.47723	942 m
431 Ba	S28.18525 E21.47740	941 m
432 Ba	S28.18524 E21.47747	942 m
433 Ba	S28.18498 E21.47781	942 m
434 Ae	S28.18484 E21.47801	942 m

Waypoint	GPS Coordinates	Altitude
436 Ba(2)	S28.17634 E21.47337	947 m
437 Ba(4)	S28.17588 E21.47336	947 m
438 Ba	S28.17524 E21.47323	947 m
439 Ba	S28.17518 E21.47342	948 m
440 Ba	S28.17517 E21.47295	948 m
441 Ba	S28.17490 E21.47309	948 m
442 Ba	S28.17486 E21.47308	948 m
443 Ba(2) + Ae	S28.17416 E21.47217	950 m
444 Ba	S28.17461 E21.47188	951 m
445 Ba	S28.17486 E21.47207	951 m
446 Ba	S28.17482 E21.47240	950 m
447 Ba	S28.17455 E21.47315	947 m
448 Ba	S28.17466 E21.47353	948 m
449 Ba	S28.17477 E21.47357	947 m
450 Ba	S28.17412 E21.47511	946 m
451 Ae	S28.17512 E21.47540	944 m
452 Ae	S28.17574 E21.47588	943 m
453 Ae	S28.17866 E21.47712	940 m
454 Ae	S28.17894 E21.47727	940 m
455 Ae	S28.17900 E21.47703	939 m
456 Ae	S28.18094 E21.47737	939 m
457 Ae	S28.18111 E21.47703	940 m
458 Ae	S28.18240 E21.47731	940 m
459 Ae	S28.18255 E21.47737	940 m
460 Ae	S28.18261 E21.47747	940 m
462 Ba	S28.19245 E21.48121	936 m
463 Ba	S28.19261 E21.48147	936 m
464 Ba	S28.19289 E21.48187	936 m
466 Ba	S28.19868 E21.48543	932 m
467 Ba	S28.19894 E21.48482	932 m
468 Ba	S28.20084 E21.48642	
469 Ba	S28.20243 E21.48708	
470 Ba	S28.20433 E21.48769	
471 Ba	S28.20510 E21.48786	
472 Ba	S28.20517 E21.48881	
473 Ba	S28.20611 E21.48871	
474 Ba(2)	S28.20725 E21.49039	930 m
475 Ba(7)	S28.20886 E21.49126	929 m

Figure 20: Google image showing the protected trees encountered per area for the northern portion of the farm Steenbokspan

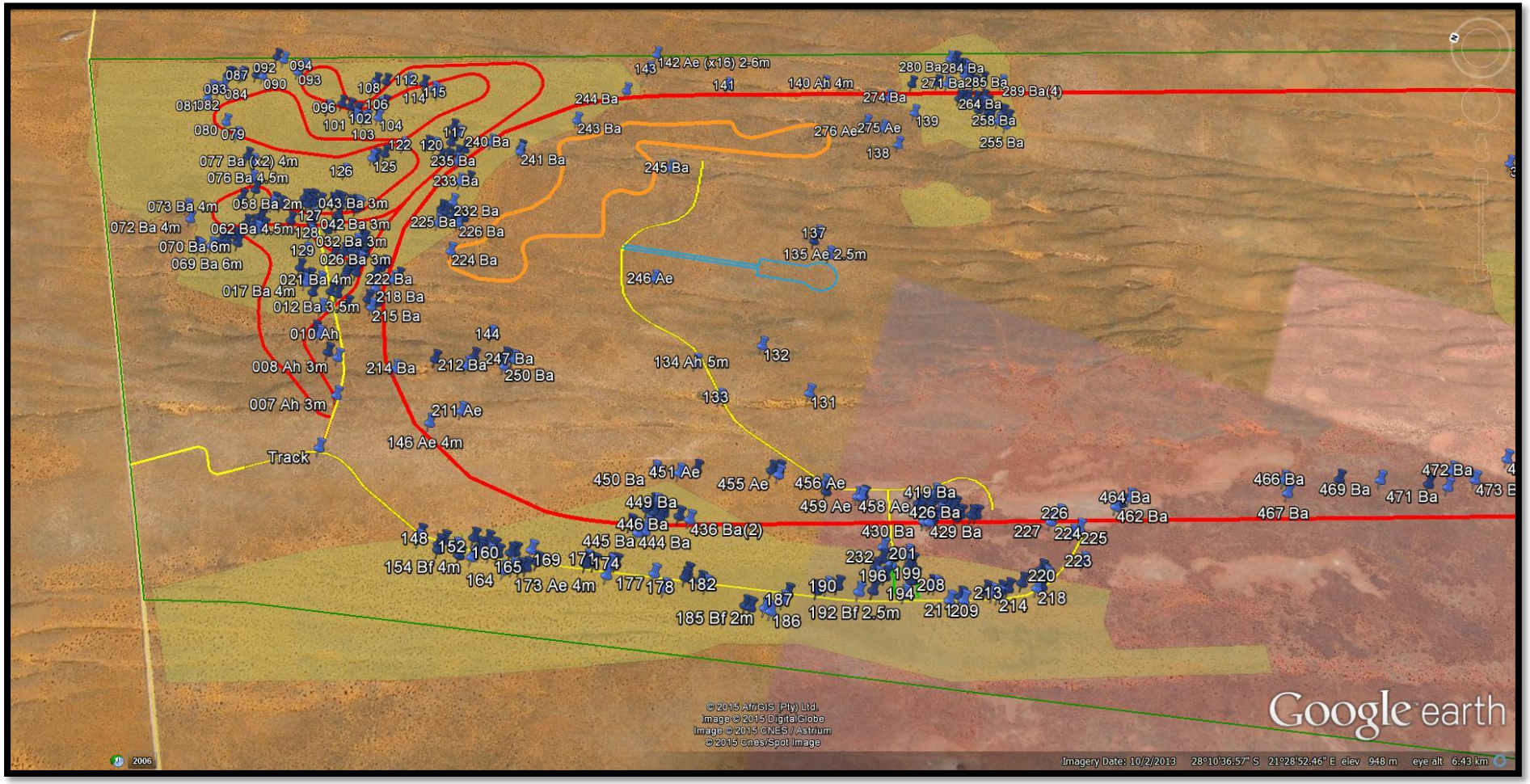
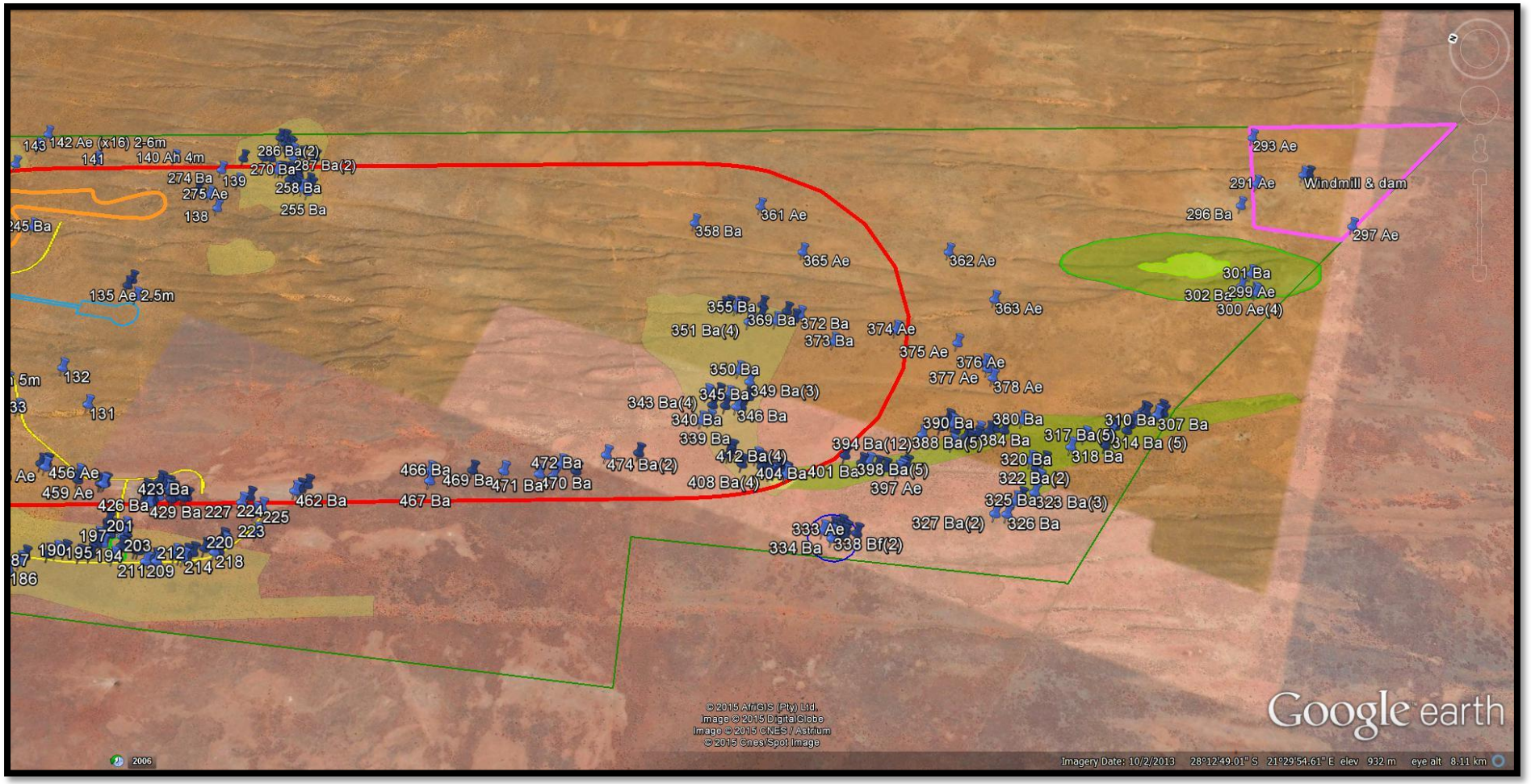


Figure 21: Google image showing the protected trees encountered per area for the southern portion of the farm Steenbokspan



APPENDIX 3: ENVIRONMENTAL FEATURES ENCOUNTERED

Figure 22: A summary map indicating significant biodiversity features encountered