



# GROOT MIER

## *Proposed low cost housing Mier Municipality Residential Project, Northern Cape*

### DRAFT BIODIVERSITY & BOTANICAL SCAN

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A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required).

January, 2013



**PREPARED BY: PB Consult**

**PREPARED FOR: ENVIROAFRICA CC**

**REQUESTED BY: MIER LOCAL MUNICIPALITY**

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## INDEPENDENCE & CONDITIONS

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

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## RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

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

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

Yours sincerely,



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## SUMMARY - MAIN CONCLUSIONS

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SUMMARY OF POSSIBLE SIGNIFICANT BIODIVERSITY FEATURES		
<b>Geology &amp; soils</b>	Geology & soils vary only slightly in the larger study area, with sandy soils found over most of the area.	No special features have been encountered (e.g. true quartz patches or broken veld) and the impact on geology and soils is expected to be very localised and low. Impact = low
<b>Land use and cover</b>	Degraded natural veld utilised for urban settlement and stock grazing.	The property is used for livestock grazing by the local inhabitants. According to the draft Siyanda EMF the property falls within an area of shrubland. As long as the protected species is incorporated within the layout design the impact is expected to be <u>low and localised</u> .
<b>Vegetation types</b>	Gordonia Plains Shrubland.	Considered “Least threatened”, but according to the draft Siyanda EMF, shrubland in good condition is given a medium conservation priority, but the specific site does not fall within a proposed conservation area or a CBA area and was given a low (2) environmental sensitivity classification. <u>Impact low</u> .
<b>Conservation priority areas.</b>	In terms of the draft Siyanda EMF	According to the EMF the site also does not fall within a proposed conservation area. <u>Impact low/localised</u> .
<b>Sensitivity index</b>	In terms of the draft Siyanda EMF	According to the EMF, the proposed site falls within an area identified as of very low environmental sensitivity (2). <u>Impact low</u> and localised.
<b>Protected plant species</b>	A number of protected tree species (Refer to Table 6), and one protected species in terms of NCNCA was observed.	Protected tree species was observed throughout the site and unless they are incorporated within the layout design they will be impacted. However, these trees are also the only shade trees in the landscape and it would make perfect sense ensure through micro-layout placement they are incorporated within the housing layout plans.  Other protected species in terms of the NCNCA should also be identified and marked on site. If any of these plants are to be disturbed a permit must first be obtained from the NC Department of Conservation.  If they are protected the impact is expected to be much reduced (only single individuals) and may be regarded as local and relative <u>low</u> .  However, if the protected species are to be removed the impact will be a much more significant <u>medium</u> (although still localised).
<b>Fauna &amp; Avi-fauna</b>	The site is used for live-stock grazing and is in close proximity to constant human activity.	Although natural fauna and avi-fauna may still be present, it is expected that it would be limited to avi-fauna, insects and maybe some reptile’s species (proximity to the town of Groot Mier and the current land-use). Apart from the possible impact on mature trees and the associated impact on wildlife the activity is not expected to have a significant impact on fauna or avi-fauna. <u>Impact low</u> .
<b>Rivers &amp; wetlands</b>	The site is traversed by small streams and drainage lines	Although most of these drainage lines are basically storm water channels with little riparian vegetation they should still be seen as significant biodiversity features, which should be protected by adequate river corridors. <u>Impact medium-low</u> .
<b>Invasive alien infestation</b>	Prosopis species was observed	All invasive alien species must be removed during the construction. <u>Impact positive</u> .
<b>Erosion</b>	The Siyanda EMF did not recognise the larger area as falling within an area subject to erosion.	This zone is relatively less sensitive than the other zones and no special parameters, except those already implemented or required by law, are proposed for this zone. <u>Impact very low</u> .

**RECOMMENDATION**

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

**Conservation priority areas:** According to Map 12a the site falls within an area regarded as having a Medium (2) conservation priority (shrublands). According to Map 12b, the site, however, does not fall within a proposed conservation area.

**Landcover:** According to Map 13 of the Draft EMF, it would seem as if the proposed site falls within the area marked as Shrubland.

**Sensitivity Index:** According to Map 14 of the Draft EMF, the proposed site falls within an area identified as of low environmental sensitivity (2) in an index which starts at Transformed and then are given values of 0-8 (8 being of high environmental sensitivity).

**Control Zones:** According to Map 15, the proposed site location falls within a control zone 7 area, which is described as a Low control zone. (This zone is relatively less sensitive than the other zones and no special parameters, except those already implemented or required by law, are proposed for this zone).

The proposed housing development will have a permanent, but very localised impact on wildlife and avi-fauna. The impact will be much more severe if all the mature indigenous trees on the site are also to be removed. The possible impact on individual species is regarded as medium (protected species), the impact on special habitats is regarded as medium-low, the impact on ecosystem function is regarded as very low, cumulative impact on ecology is regarded as low-medium and finally the impact on economic use of the vegetation is regarded as very low.

From the information available and the site visit, it is clear that the proposed activity will should not be associated with irreversible species loss, habitat loss, connectivity loss or other associated impacts. However, there could be significant difference between development **without** and development **with** mitigation. As a result it is recommended that all mitigating measures must be implemented in order to minimise the impact of construction.

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

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## 1. INTRODUCTION: GROOT MIER

The Mier Municipality is situated adjacent to one of the world's largest conservation areas, the Kgalagadi Transfrontier Park. The municipal area of Mier includes the communities of Rietfontein, Philandersbron, Loubos, Klein Mier, Groot Mier, Welkom, Askham and Noenieput. One of the world's ancient tribes, the !Khomani San, own farms and still reside in the Mier area. The lack of fresh water is a major constraint on development in the Mier area, since water pumped from underground sources is of poor quality, as a result most of the area is used for grazing by livestock or game. More than half of the 6 000 people living in Mier have never left the area. Even so, the biggest asset of Mier is the rich culture and history of its people ([www.greenkalahari.co.za](http://www.greenkalahari.co.za)).

The municipality has indicated that there is a pressing need for houses, especially low cost houses, as well as serviced plots within all of the communities within the Mier Municipal Area. This is reflected by the housing backlog contained in the 2009/10 version of the Mier IDP (BVi, 2011). The Mier Municipality residential project, are proposing the development of a number of low cost housing at the towns of Rietfontein, Loubos, Askham, Welkom, Groot Mier and Noenieput to alleviate some of the housing problems of the Municipality.

Groot Mier is located approximately 230 km north-north-west from Upington and 100 km from the Kgalagadi Transfrontier Park, one of the world's largest conservation areas. Groot Mier is located on Erf 112, Groot Mier, which is owned by the Mier Municipality. No formal land use management system has been adopted by the Mier Municipality at this stage and the land use rights on the property may be described as being undetermined. The Mier Municipality has instructed Macroplan Town and Regional Planners to rezone and subdivide Erf 112 in order to establish 198 new development stands in Groot Mier, 190 of which are single residential Ervin, in response to the growing housing need in the municipality.

The specific location has been chosen for the following reasons:

- It is located on Municipal owned land.
- The specific location was chosen by the Municipality and local town planners in order to try and integrate the new Ervin with the rest of Groot Mier.
- It is suitably placed in terms of services.

However, the property and its immediate surrounding areas are still to some degree covered by natural veld. As a result a Biodiversity Scan of the proposed location was commissioned in order to evaluate the environmental impact(s) of the proposed project and to establish whether further and more in depth studies would be required. Since the need for additional housing is very apparent this biodiversity study will mainly aim to minimise the environmental impact through correct placement.



From an ecological perspective the specific site location makes immediate sense for the following reasons:

- It will be located on an area already disturbed to some degree as a result of “residential creep”. Myriad pedestrian walkways crisscross the property, while it is also used as a playground and grazing for domestic animals belonging to the local inhabitants.
- The proposed area is not currently in pristine condition.

Significant biodiversity features encountered during the site visit.

- A small stream / drainage line crosses through the south of the proposed housing site.
- In addition, one *Acacia erioloba* and number of *Boscia albitrunca* was observed scattered throughout the property (Protected in terms of the NFA).

However, by establishing a river corridor along the river, within the development, and by taking into account the location of the protected trees (which are widely scattered) it might be possible to establish the proposed development without significant impacts on these features (during construction).

## 1.1 TERMS OF REFERENCE

EnviroAfrica (Pty) Ltd was appointed by BVi Consulting Engineers (Upington) as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment (EIA) Process for the proposed development. PB Consult was appointed by EnviroAfrica to conduct a Biodiversity Scan of the proposed site.

PB Consult was appointed within the following terms of reference:

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

The study includes the following:

- A brief discussion of the local environment in order to give some 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 species list 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 on the hand of the field survey and from available literature.
- An evaluation of the potential impact of the proposed project on habitat and species using Van Schoor's method for impact evaluation.
- 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):** To provide for the sustainable utilization of wild animals, aquatic biota and plants.

## **2.1 NORTHERN CAPE NATURE CONSERVATION ACT 9 OF 2009**

On the 12<sup>th</sup> of December 2011, the new Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect, which 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. The NCNCA is a very important Act in that it put a whole new emphasis on a number of species not previously protected in terms of legislation.

It also put a new emphasis on the importance of species, even within vegetation classified as “Least Threatened” (in accordance with GN 1002 of 9 December 2011, promulgated in terms of the National Environmental Management Biodiversity Act 10 of 2004). Thus even though a project may be located within a vegetation type or habitat previously not considered under immediate threat, special care must still be taken to ensure that listed species (fauna & flora) are managed correctly.

### 3. DEFINITIONS & ABBREVIATIONS

#### 3.1 DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### 3.2 ABBREVIATIONS

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

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## 5. PROJECT DESCRIPTION

The municipality has indicated that there is a pressing need for houses, especially low cost houses, as well as serviced plots within all of the communities within the Mier Municipal Area. This is reflected by the housing backlog contained in the 2009/10 version of the Mier IDP. The backlog within the Mier Municipal area was 1380 (Refer to Table 1). The Mier Municipality does not have the financial- and/or human resources available to initiate this development process on their own. The municipality is supported by COGHSTA (Northern Cape) and BVi Consulting Engineers.

The need in terms of housing of phase 1a, covered in the BVi (2011) business plan, in the Mier area are as follows:

**Table 1: Identified need for low cost housing in the Mier Municipality (BVi, 2011)**

Description	Project	Houses	Town Planning	Geo-Tech	Land Surveying	EIA (1A)
Fill in Houses	Rietfontein	114		114		
	Loubos	55		55		
	Philandersbron	70		70		
	Klein Mier	55		55		
	Groot Mier	40		40		
	Welkom	70		70		
	Groot Mier	100		100		
New Developments (Greenfields)	Groot Mier	178	178	178	178	178
	Welkom	103	103	103	103	103
	Loubos	138	138	138	138	138
	Rietfontein	107	107	107	107	107
	Groot Mier	100	100	100	100	100
<b>Totals</b>		<b>1130</b>	<b>626</b>	<b>1130</b>	<b>626</b>	<b>626</b>

The Mier Residential Project aims at providing for the need for additional formal Ervin and housing through “in-fill” development within existing build-up areas and the servicing of new areas for formal Ervin (Greenfields). Since the Mier townships were formally planned and developed, before the current EIA legislation, no EIA are needed for existing formal towns (“in fill” development). However, environmental authorization is needed for the development of the new or “greenfield” developments. This biodiversity scan is only applicable to these latter developments.

Greenfield development will entail the construction and placement of all services (water, electricity and sewerage systems) and road infrastructure to service the new town extensions. In effect it will basically mean the levelling and removal of all natural vegetation (except large trees wherever possible) from the site and the establishment of a new town. Since the need for such housing is very apparent this biodiversity study will mainly aim to minimise the environmental impact through correct placement.

## 5.1 METHODS

Desktop studies were conducted, coupled by a physical site visit during September 2012. The timing of the site visit was reasonable in that essentially all perennial plants were identifiable and although the possibility remains that a few species may have been missed, the author is confident that a fairly good understanding of the biodiversity status in the area was obtained.

The survey was conducted by walking through the site and examining, marking and photographing any area of interest (Refer to Figure 1 underneath). Confidence in the findings is high. During the site visit the author endeavoured to identify and locate all significant biodiversity features, including rivers, streams or wetlands, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

Figure 1: Google image indicating the route walked during the site visit as well as GPS reference points taken



A number of protected tree species were encountered, which includes a number of *Boscia albitrunca* (Sheppard's tree) and one individual of *Acacia erioloba* (Camel thorn) scattered through the site and its immediate surroundings.

## 6. DESCRIPTION OF ENVIRONMENT

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

### 6.1 LOCATION & LAYOUT

Groot Mier is situated in the central sections of the Mier Municipality adjacent to the R31 regional road in the Northern Cape Province (Siyanda District Municipality). The town is located approximately 246 km north of Upington, via the R360 & R31 and  $\pm 37$  km to the east of Rietfontein (via R31) (Figure 2 - 4).

Figure 2: General location of the town within South Africa

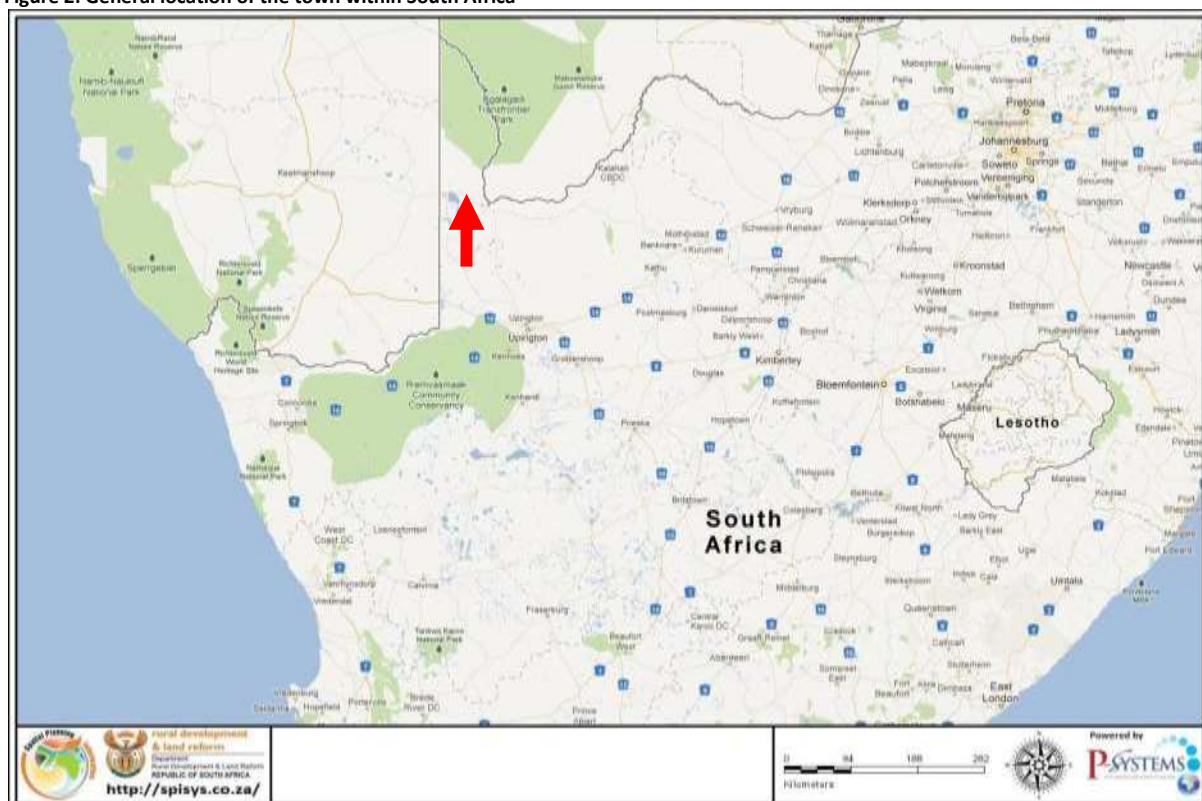


Table 2: GPS coordinates for Groot Mier, Local settlement and the proposed new development

DESCRIPTION	LATITUDE AND LONGITUDE	ALTITUDE
Groot Mier	S26 44 29.3 E20 19 18.9	856 m
Existing Local Settlement	S26 44 30.0 E20 19 10.5	842 m
Proposed new development	S26 44 38.6 E20 19 06.7	837 m





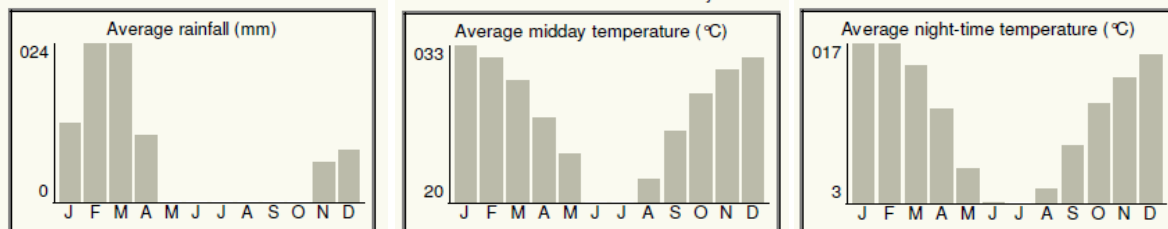
## 6.2 TOPOGRAPHY

The town of Groot Mier is located on a very flat area, with a nominal downward slope in a south-eastern direction. The site is traversed by drainage-lines. Elevation data in Table 2 shows that the mean elevation of the elevation varies from 856 – 861 m.

## 6.3 CLIMATE

All regions with a rainfall of less than 400 mm per year are regarded as arid. Separate information for Groot Mier could not be found, but is located very near to Askham for which the following holds true. Askham normally receives about 84 mm of rain per year, with most rainfall occurring mainly during summer. The chart below (lower left) shows the average rainfall values for Groot Mier per month. It receives the lowest rainfall (0 mm) in May and the highest (24 mm) in February. The temperatures at Groot Mier is typical of a desert climate in summer reaching between approximately 30°- 40°C during the day and the middle twenties in the evening. Winter goes to the other end of the scale with daylight temperatures measuring around 20°C and the evenings between 0°- 5°C. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Groot Mier range from 20°C in June to 33°C in January. The region is the coldest during July when the mercury drops to 2.9°C on average during the night. Consult the chart below (lower right) for an indication of the monthly variation of average minimum daily temperatures ([www.saexplorer.co.za](http://www.saexplorer.co.za)).

Figure 5: Average rainfall, temperature and night-time temperatures for Groot Mier ([www.saexplorer.co.za](http://www.saexplorer.co.za))



## 6.4 GEOLOGY & SOILS

According to Mucina and Rutherford (2006) and the SANBI Biodiversity Geographical Information System, the geology and soils for this area is described as aeolian sand underlain by calcretes of the Kalahari Group, deep, loose, sandy soils of the Namib soil form on the flat plains. Land types are mainly Ah and Af with a little Ae (Mucina & Rutherford, 2006).

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

Figure 6: General soil map for the area (SANBI BGIS)



## 6.5 LANDUSE AND COVER

The proposed housing project location is situated within the Eastern Kalahari Bushveld Bioregion. All of these properties are used mainly for livestock grazing and or game farming (Refer to Figure 8). No intensive farming has been observed (lack of irrigation water). At present the proposed site and in fact all of the available Municipal land on the remainder of Erf 122, Groot Mier is used for livestock grazing by the local community. Although natural fauna and avi-fauna may still be present, it is expected that it would be limited to avi-fauna, insects and maybe some reptile's species. The location of the proposed study area (next to and within the existing Groot Mier settlement) ensures that very little game is expected to be encountered (none was observed).

Natural vegetation forms a very sparse layer over some of the proposed site, but most of the proposed site studied/encountered, were found to have already been transformed as a result of urban creep and associated activities and now represents open areas used for playgrounds, informal roads, footpaths and grazing.

The main biodiversity features of this area are:

- the remaining natural veld (even though impacted as a result of "urban creep" and grazing);
- the drainage lines to the south of the property;
- the protected trees observed (e.g. *Acacia erioloba* and *Boscia albitrunca*).
- Please note one protected species listed in terms of schedule 2 of the Northern Cape Nature Conservation Act (NCNCA) was observed (refer to Paragraph 6.8).

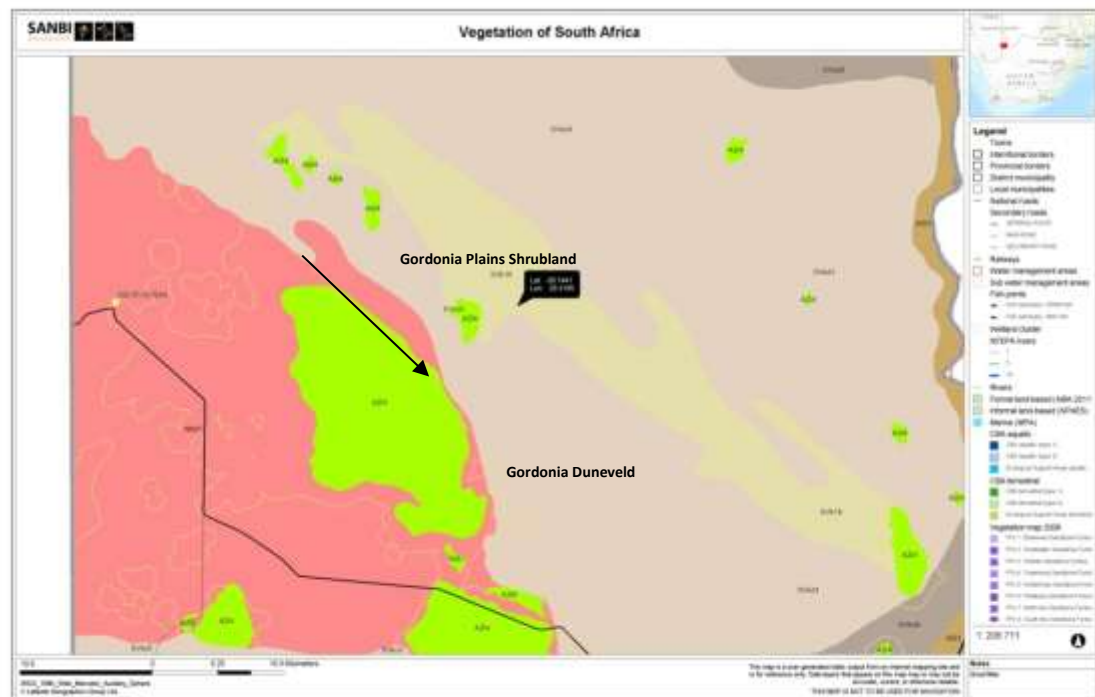
Figure 7: National land cover map indicating the Landcover expected



### 6.6 BROAD SCALE VEGETATION TYPES EXPECTED

In accordance with the 2006 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation type is expected on the property, namely *Gordonia Plains Shrubland*, with *Gordonia Duneveld* surrounding this vegetation type (Figure 9).

Figure 8: Vegetation map of SA, Lesotho and Swaziland (2006)



According to the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011), both *Gordonia Plains Shrubland* and *Gordonia Duneveld* are classified as “Least Threatened”.

Table 3: Vegetation status according to the 2004 National Spatial Biodiversity Assessment

VEGETATION TYPE	NATIONAL STATUS 2011	REMAINING	CONSERVATION TARGET	FORMALLY CONSERVED
Gordonia Plains Shrubland	Least Threatened	99.8 %	16 %	8.6 %
Gordonia Duneveld	Least Threatened	99.8 %	16 %	14.2 %

According to Mucina & Rutherford (2006), Gordonia Plains Shrubland is found in the Northern Cape Province in a broad north-south band on flats west of Korannaberg and Langeberg Mountains (and their western pediment) and east of the main Kalahari Duneveld area, as well as from Van Zylsrus in the north to southwest of Witsand the south and as a number of isolated patches embedded in the Duneveld in the Kgalagadi Transfrontier Park as well as the valley containing Groot- and Klein Mier south of the Park. Altitude varies from 900 m to 1 250 m. Gordonia Plains Shrubland covers just over 10% of the Siyanda Municipal area.

Gordonia Duneveld is found in the Northern Cape Province along the larger part of the South African side of the Kgalagadi Transfrontier Park south of the Molopo River (west of Van Zylsrus), interleaving with Kalahari Karroid Shrubland in the west and south at altitudes varying from 1 100 -1 500 m.

#### 6.6.1 Gordonia Plains Shrubland

The vegetation type is described as open grassland plains with occasional shrubs which include *Rhigozum trichotomum* and *Grewia flava*, sometimes including *Acacia haematoxylon* and scattered individuals of *Acacia erioloba*.

Important taxa includes the Tall tree: *Acacia erioloba*; Small Tree: *Acacia mellifera*; Tall Shrubs: *Grewia flava*, *Rhigozum trichotomum*; Low Shrubs: *Jatropha erythropoda*, *Plinthus sericeus*, *Requienia sphaerosperma*; Herbaceous climber: *Merremia tridentata*; Graminoids: *Aristida meridionalis*, *Centropodia glauca*, *Eragrostis lehmanniana*, *Schmidtia kalahariensis*, *Brachiaria glomerata*, *Bulbostylis hispidula*, *Eragrostis pallens*, *Stipagrostis uniplumis*. Herbs: *Acanthosicyos naudinianus*, *Cucumis africanus*, *Dicoma capensis*, *Harpagophytum procumbens*, *Heliotropium ciliatum*, *Hermannia tomentosa*, *Ipomoea hackeliana*, *Limeum argute-carinatum*, *Oxygonum dregeanum*, *Senna italica* and *Sericorema remotiflora*.

## 6.7 VEGETATION ENCOUNTERED

The following is a discussion of the vegetation and other significant environmental features encountered. The author did not attempt to identify all species but rather concentrated on identifying and marking protected plant species or any other biodiversity feature of significance.

The site visit confirms that the vegetation conforms to a disturbed form of Gordonia Plains Shrubland. The expected grassy component of the vegetation is almost totally lost, most probably as a result of grazing pressure over a long period of time, combined with urban creep (trampling) and low rainfall. Although grasses



are still present they do not dominate the vegetation composition as expected. As a result the vegetation resembles a disturbed sparse shrubland with small to medium trees occasionally found scattered therein. A number of small drainage lines were encountered to the south of the property, crossing the property from a westerly to a south easterly direction. Small seasonal streams (dry at the time of the visit) were encountered on the property. However, these streams also usually tapered out onto the plains towards the east of the proposed site.

**Photo 1: View of the vegetation on the southern portion of the property (west to east)**



The vegetation showed a definite three layer structure:

- a) The grassy bottom layer was heavily impacted (but is expected to be more prominent after the rainy season). Apart from the few remaining grass species, the following small shrubs were also encountered: *Aptosimum spinescens*, *Geigeria filifolia* and *Tribulus terrestris*.
- b) The shrub middle layer reaches approximately 1.5 m and consists out of various shrubs including: *Grewia flava*, *Hermannia cf. spinosa*, *Kleinia longiflora*, *Lycium* species, *Pechuel-Loeschea leubnitziae* and *Rhigozum trichotomum*.

**Photo 2: View of the vegetation east of the settlement (from north to south)**



Photo 3: *Aptosimum cf. spinescens* (Doringviooltjie)Photo 4: *Geigeria filifolia* (Vermeerbos)

- c) The top tree layer reaches approximately 3 m and consists mostly of scattered *Boscia albitrunca* individuals, *Ziziphus mucronata* encountered next to the dry streams and one individual of *Acacia erioloba* on the soccer field to the north east of the proposed site. A number of smaller *Prosopis* trees were also encountered throughout the proposed site.

Figure 9: A Google image giving an overview of the landscape on which the proposed site is to be located

Photo 5: *Acacia erioloba* on the soccer fieldPhoto 6: *Boscia albitrunca* & *Ziziphus mucronata* next to a stream

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

SPECIES NAME	COMMON NAME	FAMILY	STATUS
<i>Acacia erioloba</i>	Camelthorn	FABACEAE	Protected in terms of the NFA
<i>Aptosimum spinescens</i>	Doringviooltjie	SCROPHULARIACEAE	
<i>Boscia albitrunca</i>	Sheppard's tree	CAPPARCEAE	Protected in term of the NFA
<i>Geigeria filifolia</i>	Vermeerbos	ASTERACEAE	
<i>Grewia flava</i>	Velvet brandy bush	MALVACEAE	
<i>Hermannia cf. spinosa</i>	Steekbossie	STERCULIACEAE	
<i>Kleinia longiflora</i>	Sjambokbos	ASTERACEAE	
<i>Lycium cf. bosciifolium</i>	Slapkriedoring	SOLANACEAE	
<i>Pechuel-Loeschea leubnitziae</i>	Wild Sage	AIZOACEAE	<b>Protected in terms of schedule 2 of NCNCA.</b>
<i>Prosopis grandulosa</i>	Honey mesquite	FABACEAE	Category 2 invader
<i>Rhigozum trichotomum</i>	Driedoring	BIGNONIACEAE	
<i>Tribulus terrestris</i>	Dubbeltjie	ZYGOPHYLACEAE	Weed
<i>Ziziphus mucronata</i>	Blinkblaar wag-'n-bietjie	RHAMNACEAE	

## 6.8 SIGNIFICANT AND/OR PROTECTED PLANT SPECIES

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.

The National Forests Act of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species (GN 716 of 7 September 2012). **Two listed protected species (namely *Acacia erioloba* and *Boscia albitrunca*) were encountered within the study area.** Refer to Table 7 for location data on the individual trees encountered.

Table 5: NFA protected tree species with a geographical distribution that may overlap the broader study area

SPECIES NAME	COMMON NAME	TREE NO.	DISTRIBUTION
<i>Acacia erioloba</i>	Camel Thorn Kameeldoring	168	In dry woodlands next to water courses, in arid areas with underground water and on deep Kalahari sand
<i>Boscia albitrunca</i>	Shepherds-tree Witgat/Matopie	130	Occurs in semi-desert and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils.
<i>Acacia haematoxylon</i>	Grey Camel Thorn Vaalkameeldoring	169	In bushveld, usually on deep Kalahari sand between dunes or along dry watercourses.

In addition to the above the Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12<sup>th</sup> of December 2011, which 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. Refer to Table 5, showing that one protected species was encountered within the proposed site, namely ***Pechuel-Loeschea leubnitziae***.

Table 6 gives the GPS co-ordinates of the protected trees encountered within the site.

**Table 6: A list of protected trees encountered during the site visit, referenced by GPS waypoints (WG84 format)**

Waypoint no.	SPECIES NAME	COMMON NAME	NUMBER OF TREES	LOCATION
099	<i>Acacia erioloba</i>	Camelthorn	single	S26 44 28.2 E20 19 13.4
101	<i>Boscia albitrunca</i>	Sheppard's tree	single	S26 44 36.9 E20 19 03.5
102	<i>Boscia albitrunca</i>	Sheppard's tree	single	S26 44 36.2 E20 19 03.2
105	<i>Boscia albitrunca</i>	Sheppard's tree	2 individuals	S26 44 35.2 E20 19 01.1
106	<i>Boscia albitrunca</i>	Sheppard's tree	Cluster	S26 44 35.4 E20 18 59.4
107	<i>Boscia albitrunca</i>	Sheppard's tree	single	S26 44 36.6 E20 18 57.3
108	<i>Boscia albitrunca</i>	Sheppard's tree	single	S26 44 38.2 E20 18 56.5
109	<i>Boscia albitrunca</i>	Sheppard's tree	single	S26 44 39.1 E20 18 57.2
110	<i>Boscia albitrunca</i>	Sheppard's tree	single	S26 44 39.9 E20 18 59.1
111	<i>Boscia albitrunca</i>	Sheppard's tree	single	S26 44 38.5 E20 19 00.3

#### 6.8.1 Camelthorn

Photo 7 shows a mature *Acacia erioloba* (Camelthorn) tree found on site. The slow-growing Camelthorn grows well in poor soils and in harsh environmental conditions. However, they will take up to 10 years before starting to flower, and only by age 20, will produce regular large pod crops (Seymour & Milton, 2003). It is this of great important that especially 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.

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 are now protected species tree species in South Africa in terms of National Forests Act (GN 716 of 7 September 2012).

#### 6.8.2 Sheppard's tree

Photo 6 show a beautiful full grown Sheppard's tree encountered on site. 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).

## 6.9 FINE-SCALE MAPPING (CBA'S)

Although a draft version of the Siyanda District Municipal, Environmental Management Framework (EMF) is available it has not been approved or published. 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, the proposed priorities for conservation in the Siyanda District is depicted on Maps 12a (Refer Figure 15) and 12b within this document, 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.

The landcover of the Siyanda district reflects the results of the 2000 national landcover determination and is depicted on Map 13 from which it is evident that most of the area is in a natural state and the most significant spatial impact on the environment has come from mining which occupies an area of almost 7% of the total area.

A sensitivity index is shown on Map 14 of the Draft EMP. The main factors that were used to compile the index include the following:

- The erosion potential of soil where soils with a high erosion potential were awarded a sensitivity of 1;
- The conservation priority of veld types for veld types with a medium conservation priority were awarded a sensitivity count of 1 those with a high conservation priority were awarded a count of 2 and those with a very high conservation priority were awarded a count of 3;

- Topographical areas with a high variance in shape and form were awarded a sensitivity count of 1;
- All watercourses, drainage lines and pans (including a 32m buffer on either side) were awarded a sensitivity count of 2; and
- All transformed areas were awarded a sensitivity count of -1.

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.

#### 6.9.1 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.

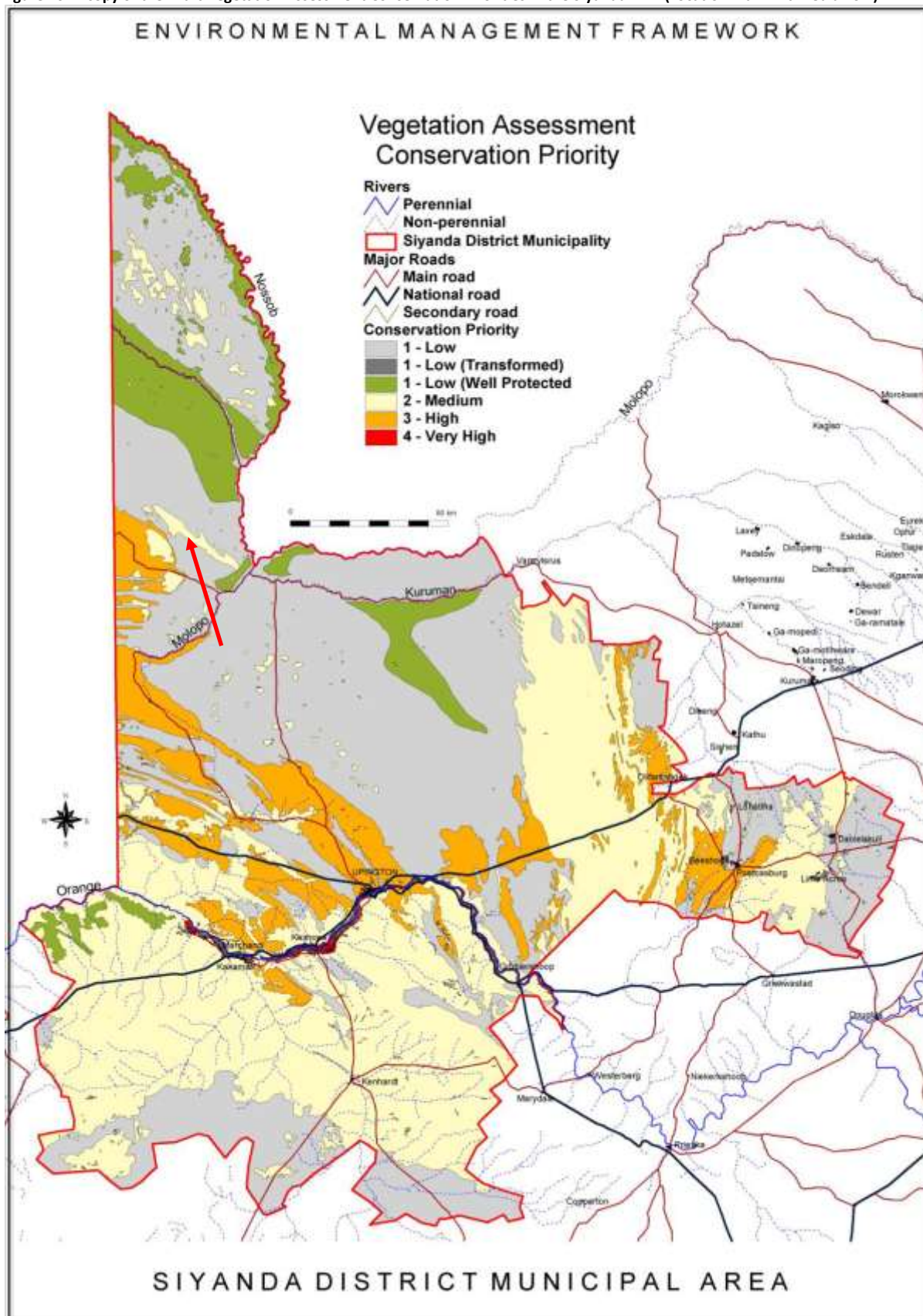
**Conservation priority areas:** According to Map 12a the site falls within an area regarded as having a Medium (2) conservation priority (shrublands). According to Map 12b, the site, however, does not fall within a proposed conservation area.

**Landcover:** According to Map 13 of the Draft EMF, it would seem as if the proposed site falls within the area marked as Shrubland.

**Sensitivity Index:** According to Map 14 of the Draft EMF, the proposed site falls within an area identified as of low environmental sensitivity (2) in an index which starts at Transformed and then are given values of 0-8 (8 being of high environmental sensitivity).

**Control Zones:** According to Map 15, the proposed site location falls within a control zone 7 area, which is described as a Low control zone. (This zone is relatively less sensitive than the other zones and no special parameters, except those already implemented or required by law, are proposed for this zone).

Figure 10: A copy of the Draft Vegetation Assessment Conservation Priorities in the Siyanda EMF (Location mark with red arrow)



### 6.9.2 Key Environmental issues identified in the EMF

The following are considered to be the main environmental issues that may cause negative impacts and have to be addressed in the EMF:

- The conservation of the remaining Lower Gariep Alluvial Vegetation along the Orange River;
- the protection of vegetative groundcover across the area against overgrazing and other activities such as 4x4 and quad bike driving;
- the effect that inappropriate irrigation may have on the salination of soil in places;
- the provision of services, especially water to small populations in remote areas that may be unsustainable over the long term;
- the extensive use of firewood for cooking and heating that may be a threat to especially the protected Camel Thorn trees in places; and
- the rehabilitation of mining areas, especially along scenic routes that may have potential for further tourism development.

According to the EMF maps and the summary underneath the main environmental issues identified for the broad scale area would be the medium conservation status given to shrubland in good condition.

## 6.10 FAUNA AND AVI-FAUNA

Although natural fauna and avi-fauna may still be present, it is expected that it would be limited to avi-fauna, insects and maybe some reptile's species. Because of the proximity to the town of Groot Mier and the current land-use it is not expected that game will be encountered in the vicinity of the site (none has been observed). 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. Human activity in the area is medium-high and it is highly unlikely that a fair representation of these mammals will be found on the property. Even though the impact will be permanent, it is highly unlikely that it will pose a significant impact on mammal species and as a result the impact is deemed negligible.

**Reptiles:** The site falls within the distribution range of approximately 30 reptile species, indicating low diversity. 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 and geckos. Human activity in the area is medium-high and it is highly unlikely that large numbers of these species will be present on site. As such, the impact on reptiles should be negligible.



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

**Avi-fauna:** The site falls within the distribution range of approximately 200 bird species known from the broad area. 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. Apart from the possible impact on mature trees (mentioned above) 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.

### 6.11 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.

With the exception of the Orange River all the rivers in the Siyanda District Municipal area are non-perennial rivers and the 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. There are no formal rivers on the proposed site, but a number of drainage channels and small streams draining water from the slightly higher ground just west of Groot Mier drain rain water onto the relative flat area in the general location of the Groot Mier settlement. Although most of these drainage lines are basically storm water channels with little riparian vegetation they should still be seen as significant biodiversity features, which should be protected by adequate river corridors.

### 6.12 INVASIVE ALIEN INFESTATION

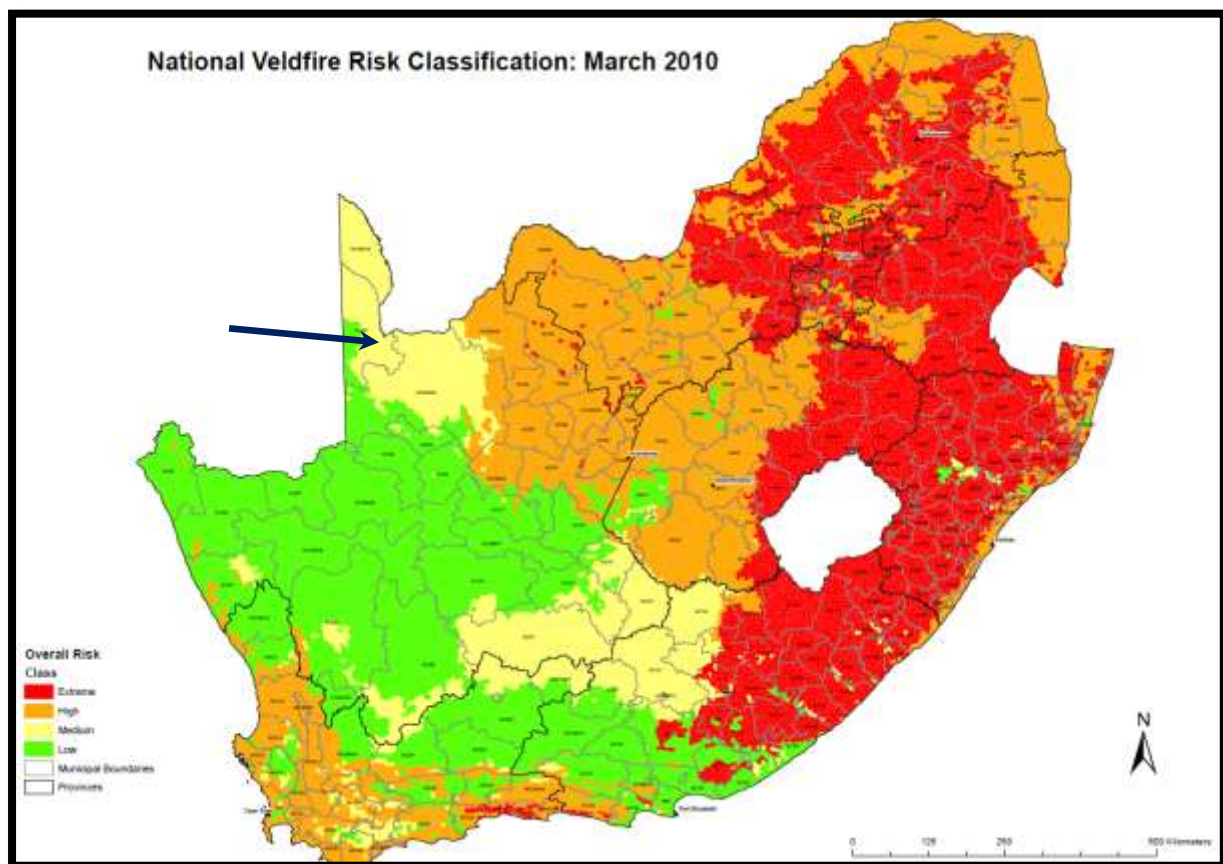
The only invasive alien vegetation encountered on site was scattered individuals of *Prosopis grandulosa* (a category 2 invader). According to regulation 15 and 16 of CARA all category 2 plants has the proven potential of becoming invasive, but may have certain beneficial properties. The regulations makes provisions for category 2 plants to be retained in special areas demarcated for that purpose, but those occurring outside demarcated areas must be controlled.

In this case all *Prosopis* individuals should be removed.

## 7. VELD FIRE RISK

Gordonia Duneveld is part of the Savanna Biome (Mucina & Rutherford, 2006) which is prone to veldfires. According to Forsyth (2010), the main fire issue relates to its effects on the number and size of woody plants in the savanna mixture, which in turn determines the productivity and quality of the grasses. Frequent, high-intensity fires suppress trees and thus promote grasses, while protection from fire, and lower intensity fires (often associated with high levels of grazing, and correspondingly lower grass fuel loads) allows woody plants to increase, the widespread “bush encroachment” phenomenon. According to the revised veldfire risk classification of March 2010 (Forsyth, 2010) in terms of the National Veld and Forest Fire Act 101 of 1998, the site is located in an area classified as a “Medium Fire Risk” area.

Figure 11: South African National Veldfire Risk Classification (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.

Groot Mier is situated in the Mier local Municipal area and has a medium fire risk classification. Although, the fire risk is not considered high or extreme 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.

## 7.1 SIGNIFICANT BIODIVERSITY FEATURES ENCOUNTERED

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 7: Summary of biodiversity features encountered and their possible significance**

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING
Geology & soils	Geology & soils vary only slightly in the larger study area, with sandy soils found over most of the area.	No special features have been encountered (e.g. true quartz patches or broken veld) and the impact on geology and soils is expected to be very localised and low. Impact = low
Land use and cover	Degraded natural veld utilised for urban settlement and stock grazing.	The property is used for livestock grazing by the local inhabitants. According to the draft Siyanda EMF the property falls within an area of shrubland. As long as the protected species is incorporated within the layout design the impact is expected to be <u>low and localised</u> .
Vegetation types	Gordonia Plains Shrubland.	Considered "Least threatened", but according to the draft Siyanda EMF, shrubland in good condition is given a medium conservation priority, but the specific site does not fall within a proposed conservation area or a CBA area and was given a low (2) environmental sensitivity classification. <u>Impact low</u> .
Conservation priority areas.	In terms of the draft Siyanda EMF	According to the EMF the site also does not fall within a proposed conservation area. <u>Impact low/localised</u> .
Sensitivity index	In terms of the draft Siyanda EMF	According to the EMF, the proposed site falls within an area identified as of very low environmental sensitivity (2). <u>Impact low</u> and localised.
Protected plant species	A number of protected tree species (Refer to Table 6), and one protected species in terms of NCNCA was observed.	Protected tree species was observed throughout the site and unless they are incorporated within the layout design they will be impacted. However, these trees are also the only shade trees in the landscape and it would make perfect sense ensure through micro-layout placement they are incorporated within the housing layout plans.  Other protected species in terms of the NCNCA should also be identified and marked on site. If any of these plants are to be disturbed a permit must first be obtained from the NC Department of Conservation.  If they are protected the impact is expected to be much reduced (only single individuals) and may be regarded as local and relative <u>low</u> .  However, if the protected species are to be removed the impact will be a much more significant <u>medium</u> (although still localised).
Fauna & Avi-fauna	The site is used for live-stock grazing and is in close proximity to constant human activity.	Although natural fauna and avi-fauna may still be present, it is expected that it would be limited to avi-fauna, insects and maybe some reptile's species (proximity to the town of Groot Mier and the current land-use). Apart from the possible impact on mature trees and the associated impact on wildlife the activity is not expected to have a significant impact on fauna or avi-fauna. Impact <u>low</u> .
Rivers & wetlands	The site is traversed by small streams and drainage lines	Although most of these drainage lines are basically storm water channels with little riparian vegetation they should still be seen as significant biodiversity features, which should be protected by adequate river corridors. Impact medium-low.
Invasive alien infestation	Prosopis species was observed	All invasive alien species must be removed during the construction. Impact positive.
Erosion	The Siyanda EMF did not recognise the larger area as falling within an area subject to erosion.	This zone is relatively less sensitive than the other zones and no special parameters, except those already implemented or required by law, are proposed for this zone. Impact very low.

In summary, the proposed site is located in disturbed natural vegetation (grazing and urban creep), with very good connectivity with the surrounding natural veld. However, the proposed impact will be localised. The impact on individual species is regarded as medium to low (protected species), the impact on sensitive habitats is regarded as low to very low, the impact on ecosystem function is regarded as very low (but erosion prevention measures must be assured), cumulative impact on ecology is regarded as very low and finally the impact on economic use of the vegetation is regarded as very low.

## 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 biological diversity associated with 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 NATURE OF THE IMPACT

The construction of the proposed low cost housing entails:

- the layout planning and location of the proposed housing within the larger site;
- clearing of the footprint (including topsoil);
- installation of Municipal works (water, sewerage and electricity) and associated infrastructure (e.g. roads);
- construction of housing; and
- rehabilitation of the construction footprint (outside the designated housing area) on completion of the project.

#### 8.1.1 Parameters of the impact

Extent of the impact: Local.

Duration of the impact: Permanent

Probability or likelihood: The probability or likelihood that the impact will occur if the project is approved is very likely.

Severity of the impact: The severity of the impact is considered to be medium to low depending on the impact minimisation actions implemented.

#### 8.1.2 Possible issues / impacts associated with construction

The following possible environmental impacts were identified while doing the site visit and discussing the project with the engineers and land-owners:

- The possible impact on protected species in terms of the NFA.
- The possible impact on protected plant species as described in the “List of protected tree species” (GN 716 of 2012) and the “Protected Species” list (Schedule 1 & 2 of the NC Nature Conservation Act 9 of 2009).
- Establishment of a construction camp and site offices as well as the possibility of labourer’s facilities during construction.
- Temporary storage areas.
- Waste management and control.

## 8.2 EVALUATION OF SIGNIFICANT IMPACTS

The main drivers in this vegetation type would be fire and grazing pressure (herbivore), and could largely determine plant community composition and occurrence of rare species. Grazing may be an important factor in regulating competitive interaction between plants (e.g. *Acacia mellifera* encroachment is often seen as a sign of overgrazing or bad veld management). Certain species can act as important “nursery” plants for smaller species and are also important for successional development after disturbance. Tortoises and mammals can be important seed dispersal agents. Watercourses, wetlands, upland- down land gradients or vegetation boundaries are all significant ecological features.

### 8.2.1 Threatened or protected ecosystems

The site visit confirmed that the vegetation conforms to Gordonia Plains Shrubland, classified as “Least Threatened”. Recently the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011), was promulgated in terms of the National Environmental Management Biodiversity Act (NEM: BA), Act 10 of 2004. According to this National list, the vegetation type **remains classified as Least Threatened**.

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

**Conservation priority areas:** According to Map 12a the site falls within an area regarded as having a Medium (2) conservation priority (shrublands). According to Map 12b, the site, however, does not fall within a proposed conservation area.

**Landcover:** According to Map 13 of the Draft EMF, it would seem as if the proposed site falls within the area marked as Shrubland.

**Sensitivity Index:** According to Map 14 of the Draft EMF, the proposed site falls within an area identified as of low environmental sensitivity (2) in an index which starts at Transformed and then are given values of 0-8 (8 being of high environmental sensitivity).

**Control Zones:** According to Map 15, the proposed site location falls within a control zone 7 area, which is described as a Low control zone. (This zone is relatively less sensitive than the other zones and no special parameters, except those already implemented or required by law, are proposed for this zone).

The proposed housing development will have a permanent, but localised impact on wildlife and avi-fauna. The impact will be much more severe if all the mature indigenous trees on the site are also to be removed. 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).

Taking the above into account it is clear that the proposed project will have a permanent, but very localised impact on the natural vegetation as well as wildlife and might impact on protected species. On the other hand the vegetation type in which the project will be located is not considered threatened or in need of special conservation at this point in time. **The impact on threatened or protected ecosystems is thus rated as low.**

Mitigation:

- The proposed housing layout should take into account all mature indigenous tree species and should aim to minimise the impact on these. In addition it should also aim to minimise the impact on any other protected species that might be encountered on site. On-site micro- adjustment of the final layout must be done in order to minimise the impact on as many of the protected species as possible.
- Permits must be obtained for the removal of any protected species which cannot be avoided.

### 8.2.2 Special habitats

The vegetation itself is not considered to belong to a threatened or protected ecosystem. However, shrubland is classified as of medium conservation priority within the Draft Siyanda EMF, but the specific site was given a very low sensitivity index in the same report. No special habitats, were encountered on site (e.g. quartz patches or broken veld), which could sustain significant smaller ecosystems.

There are no formal rivers on the proposed site, but a number of drainage channels and small streams draining water from the slightly higher ground just west of Groot Mier drain rain water onto the relative flat area in the general location of the Groot Mier settlement. Although most of these drainage lines are basically storm water channels with little riparian vegetation they should still be seen as significant biodiversity features, which should be protected by adequate river corridors.

It is considered highly unlikely that the proposed project will have any impact on special habitats. **The impact is thus rated as medium-low.**

#### 8.2.3 Corridors and or conservancy networks

Looking at the larger site and its surroundings it shows excellent connectivity with remaining natural veld in almost all directions. Corridors and natural veld networks are still relative unscathed (apart from road networks).

Because of the localised impact of the housing project and because the site are already impacted by the Groot Mier settlement it is highly unlikely that it will have any significant additional impacts on corridors or conservancy networks. **The impact is thus rated as very low.**

#### 8.2.4 Threatened or endangered species

No threatened or endangered species were recorded during the site visit, however, this does not rule out their presence as they may be subject to seasonable rainfall and may not have been observable during the time of the site visit, since the composition of the vegetation layers will fluctuates with seasonal rainfall (Van Rooyen *et. all*, 1984, *vide* Mucina & Rutherford, 2006). However, it must be noted that the vegetation type is considered "Least Threatened" and that this classification is based on plant species diversity and turnover as well as habitat transformation. The number of species per broad geographical levels for the savannah biome is relative low (Van Rooyen, 1988, *vide* Mucina & Rutherford, 2006). It is therefore very unlikely that any red data species will be confined to the proposed site alone.

Taking the above into account it is highly unlikely that the proposed project will have a significant or long term effect on threatened or endangered species. **The impact is thus rated as low.**

#### 8.2.5 Protected species

Two protected tree species in terms of the National Forests Act of 1998 (Act 84 of 1998) have been observed and are likely to be impacted during the construction namely: *Acacia erioloba* (Camel thorn) and *Boscia albitrunca* (Sheppard's tree), refer to Table 6 for location data on the individual trees encountered.

In addition to the above the Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12<sup>th</sup> of December 2011, which 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. Even though this study never intended to be full botanical assessment, a scan of significant species was done during the site visit, and though the author does not claim that all species were recorded, only one listed protected species in terms of NCNCA was encountered during the site visit. However, as a pre-cautionary measure all viable herb-, bulbs- and succulent plant species encountered within the footprint should be removed and replanted through a dedicated search and rescue operation.

Taking the above into account it is likely that the proposed project will have an impact protected species. **The impact is thus rated as medium** (which can be reduced with mitigation).

Mitigation:

- The proposed housing layout should take into account all mature indigenous tree species and should aim to minimise the impact on these. In addition it should also aim to minimise the impact on any other protected species that might be encountered on site. On-site micro- adjustment of the final layout must be done in order to minimise the impact on as many of the protected species as possible.
- As a pre-cautionary measure all viable herb-, bulbs- and succulent plant species encountered within the footprint should be removed and replanted through a dedicated search and rescue operation.
- Permits must be obtained for the removal of any protected species which cannot be avoided.

#### 8.2.6 Direct impacts

As the name suggest, direct impacts refers to those impacts with a direct impact on biodiversity features and in this case were considered for the potentially most significant associated impacts (some of which have already been discussed above).

- Direct loss of vegetation type and associated habitat due to construction and operational activities.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities. (Refer to page 29).
- Loss of local biodiversity and threatened plant species (Refer to page 30)
- Loss of ecosystem connectivity (Refer to page 32)

The vegetation itself is not considered to belong to a threatened or protected ecosystem. No special habitats were encountered on site. However, it is likely that the proposed project will have an impact protected species. The proposed housing development will also have a permanent, but localised, impact on vegetation, wildlife and avi-fauna.



Taking the above into account the direct impact on the environment is **rated as medium-low, which can be reduced to low with mitigation.**

**Mitigation:** The following is some mitigation which will minimise the impact of the solar plant location and operation.

- The proposed housing layout should take into account all mature indigenous tree species and should aim to minimise the impact on these. In addition it should also aim to minimise the impact on any other protected species that might be encountered on site. On-site micro- adjustment of the final layout must be done in order to minimise the impact on as many of the protected species as possible.
- Permits must be obtained for the removal of any protected species which cannot be avoided.
- As a pre-cautionary measure all viable herb-, bulbs- and succulent plant species encountered within the footprint should be removed and replanted through a dedicated search and rescue operation.
- Only existing access roads should be used for access to the terrain.
- Access roads must be clearly demarcated and access must be tightly controlled (deviations may not be allowed).
- Indiscriminate clearing of areas must be avoided (all remaining areas to remain as natural as possible).
- All topsoil (at all excavation sites) must be removed and stored separately for re-use for rehabilitation purposes. The topsoil and vegetation should be replaced over the disturbed soil to provide a source of seed and a seed bed to encourage re-growth of the species removed during construction.
- Once the construction is completed all further movement must be confined to the access tracks to allow the vegetation to re-establish over the excavated areas.
- Rehabilitation must be done after construction.

#### 8.2.7 *Indirect impacts*

Indirect impacts are impacts that are not a direct result of the main activity, but are impacts still associated or resulting from the main activity. The following possible indirect impacts were associated with the proposed project:

- The possible impact on protected plant species as described in the “List of protected tree species” (GN 716 of 2012) and the “Protected Species” list (Schedule 2 of the NC Nature Conservation Act 9 of 2009).
- Establishment of a construction camp and site offices as well as labourers facilities.
- Temporary storage areas (e.g. pipe’s and fittings and concrete mixing material).
- Waste management

It is very likely that the proposed project will have indirect impacts. It is considered that indirect impacts will have a similar impact as direct impacts, which will lead to a cumulative effect on the environment. However, indirect impacts can be much reduced through good environmental control during construction. **On its own the impact is considered to be medium.**

Mitigation:

- Appoint a suitably experience ECO during the construction phase of the project.

#### 8.2.8 *Cumulative impacts*

In order to comprehend the cumulative impact, one has to understand to what extent the proposed activity will contribute to the cumulative loss of ecological function and other biodiversity features on a regional basis. Both vegetation types was classified as “Least Threatened”, No special habitats were encountered on site (e.g. quartz patches or broken veld), which could sustain significant smaller ecosystems. There are no formal rivers on the proposed site, but a number of drainage channels and small streams draining water from the slightly higher ground just west of Groot Mier drain rain water onto the relative flat area in the general location of the Groot Mier settlement. Although most of these drainage lines are basically storm water channels with little riparian vegetation they should still be seen as significant biodiversity features, which should be protected by adequate river corridors. The direct impacts will be permanent but localised, while indirect impacts can be much reduced through good environmental control.

The proposed project will thus have a permanent, but very localised impact. **On the whole the cumulative impact is considered to be low-medium.** With the implementation of impact minimisation actions the impact can easily be reduced to low.

### 8.3 *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 current status quo will remain and there will be no impact (even temporarily) on the vegetation, protected species or river corridors.

On the other hand the local municipality and governments have a socio-economic responsibility to provide basic living. Over the long term the proposed project is likely to be one of the viable solutions with acceptable environmental impact.

## 9. RECOMMENDATIONS & IMPACT MINIMIZATION

Because of the identified need for low cost housing developments in the Mier Municipal area and the socio-economical responsibility of all Governments it is highly unlikely that the “No-Go” option will be an option. Other locations may be looked at, but ultimately the need for housing will remain (and most probably increase). It is also clear that the Municipality and Town Planners considered various options carefully before approaching the EAP with the most viable options. Even though the impact will be permanent, it will also be very localised and is situated within a vegetation type not considered by either National Spatial Biodiversity Indicators or by local environmental planning initiatives (Siyanda Draft EMF, 2008) as a sensitive area. However, various protected tree species (NFA) as well as one protected species in terms of NCNCA was encountered. Various impact minimisation recommendations are given in this report, which will reduce the cumulative impact of the proposed development to a very large degree. The major impact minimisation recommendation is associated with placement and micro-placement of the final lay-out plan as well as good environmental planning and control during construction.

Having evaluated and discussed the various biodiversity aspects associated with the project it is clear that the most significant impacts associated with the project will be:

- The localised loss of natural vegetation.
- The possible impact on protected species.
- The impact on the small seasonal streams and drainage lines.

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

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

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

## 9.1 IMPACT MINIMIZATION

### 9.1.1 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 which might be required by the Department of Environmental Affairs.
- An integrated waste management system must be implemented during the construction phase.
- All rubble and rubbish (if applicable) must be collected and removed from the site to a suitable registered waste disposal site.
- All alien vegetation should be removed from the larger property.

### 9.1.2 Site placement

- All efforts must be made to protect all mature indigenous trees within the proposed final footprint (and any other protected species that might be encountered on site). On-site micro- adjustment of the final Ervin must be done in order to minimise the impact on as many of the protected species as possible.
- Only existing access roads should be used for access to the terrain. Access roads must be clearly demarcated and access must be tightly controlled (deviations may not be allowed).

### 9.1.3 Other site specific mitigation recommendations

- A suitably qualified ECO or botanist must inspect the final site with the aim of mapping the protected plant species listed in the NCNCA. Should any protected or specially protected plant be located within the final footprint, approval must be obtained from the DAFF, before any work is done on the site.
- Permits must be obtained for the removal of any protected species which cannot be avoided.
- As a pre-cautionary measure all viable herb-, bulbs- and succulent plant species encountered within the footprint should be removed and replanted through a dedicated search and rescue operation.
- Indiscriminate clearing of areas must be avoided (all remaining areas to remain as natural as possible).
- All topsoil (the top 15-20 cm at all excavation sites), must be removed and stored separately for re-use for rehabilitation purposes. The topsoil and vegetation should be replaced over the disturbed soil to provide a source of seed and a seed bed to encourage re-growth of the species removed during construction.
- Once the construction is completed rehabilitation must be implemented.

Figure 12: Google image showing the Groot Mier site, with river corridors which should be protected in blue

