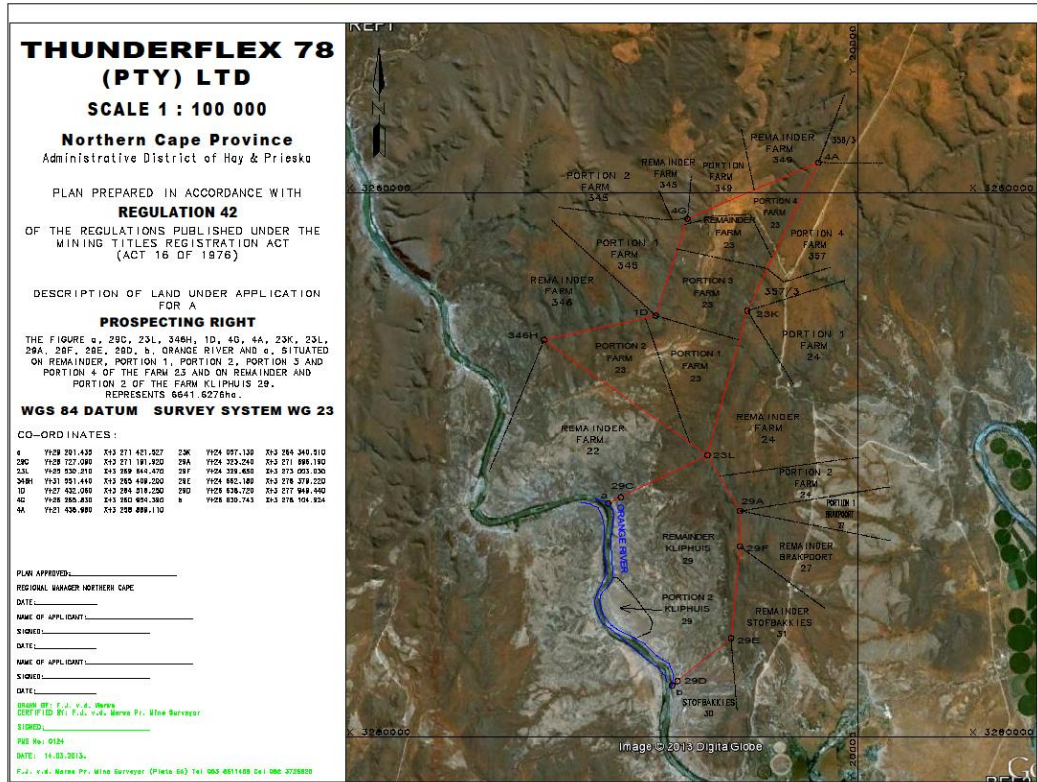


A Botanical and Soil Reconnaissance study for Farms 22 and 23, Wilgeboomfontein, Prieska.



Red lines of farms 22, 23 and 29 boundaries

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Introduction & Study area

A proposal to mine certain areas of the Wilgeboomfontein farms 22 and 23, near Prieska in the Northern Cape (from now on study area), was investigated. In the study area there is diamond mining but the proposal is to mine new undisturbed areas on these farms (Figure 1). The farms were stratified by the company and certain areas were identified for proposed mining. This study only focuses on these identified areas by the mining company (Figure 5). The proposed study area is located in the Nama Karoo Biome with two vegetation types noted. The Lower Gariep Broken Veld (Nkb1) conservation value is least threatened, it is statutorily conserved in Augrabies Falls National Park and the Northern Upper Karoo (Nku3) conservation value is also least threatened, but none is conserved in a statutorily conserved areas (Mucina & Rutherford 2006).



Figure 1: Google earth image of the study area, note the impacted areas from previous mining activities.



Figure 2: Photograph of the study area landscape physiognomy.



Figure 3: Old and current mining activities and infrastructure.

A botanical survey was carried out as part of the EIA (Environmental Impact Assessment) process.

Terms of reference

- To provide a brief overview of the vegetation and soil landscapes recorded.
- To provide a baseline list of plant species in the area.
- To identify any endangered and/or protected, or declared invader plant species.

Methods

The area was stratified into relatively homogenous physiographic-physiognomic units using Google Earth image (2014). Using the Braun-Blanquet procedure (Mueller-Dombois & Ellenberg 1974), a large sample plot was used and all the plant species were recorded and a canopy cover for each plant species was estimated. Taxa names conform to those of Germishuizen *et al.* (2006) except in the case of the old well known *Acacia* species which is known as *Vachellia karroo* and *Senegalia mellifera* which are the conspicuous plant species of the study area (Kyalangalilwa *et al.* 2013). Edwards' (1983) broad scale structural classification was used for describing the structure of the vegetation.

Results of botanical and soil reconnaissance

Soil and geomorphology

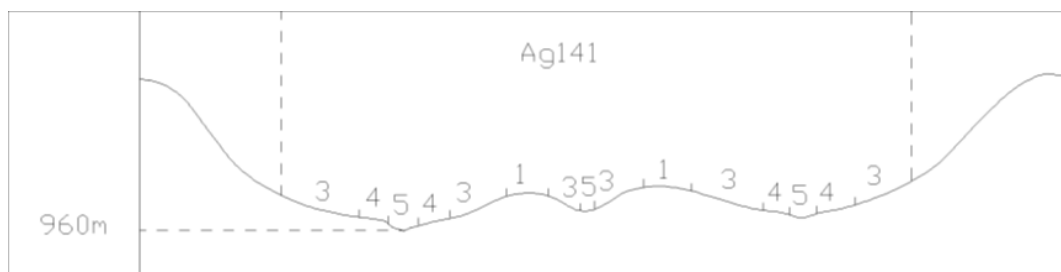


Figure 4: A terrain form sketch of the Ag141 land type of the study area (Land Type Survey Staff 2005).

Geology: Iron formation and jaspillite of the Asbestos Hills Formation (Griquatown Group) predominantly; dolomite, limestone and chert (Ghaap Plateau Formation, Campbell Group).

Dominant terrain unit and habitat characteristics: The slightly undulating midslope (3) is dominant in the landscape of the proposed mining area (Figure 4) which is closely associated with the Ag141 land type. The shallow (depth 0.1 – 0.3m), clayey (15-20% clay content) soil is well drained. The soil – rock complex is dominated by shallow Hutton soil form. A portion of the study area’s soil surface has been degraded and disturbed by previously mining activities. The rainfall in this area occurs mainly in the summer; it is erratic. Rain mostly occurs as thunderstorms (Land Type Survey Staff 2005).

The adjacent rolling hills is closely associated with the Fb385 and Ag114 land types. These hills were not surveyed because it was not in the identified proposed mining area. The adjacent Fc628 towards and closely associated with the Orange River was also not surveyed because it was out of the proposed mining area (Land Type Survey Staff 2005).

Vegetation

The landscape of the study area is dominated by a sparse shrubland with the woody *Senegalia mellifera* and the shrub-like *Rhigozum trichotomum* dominant (Table 1). Two plant communities were recorded in the proposed mining area (Figure 5).

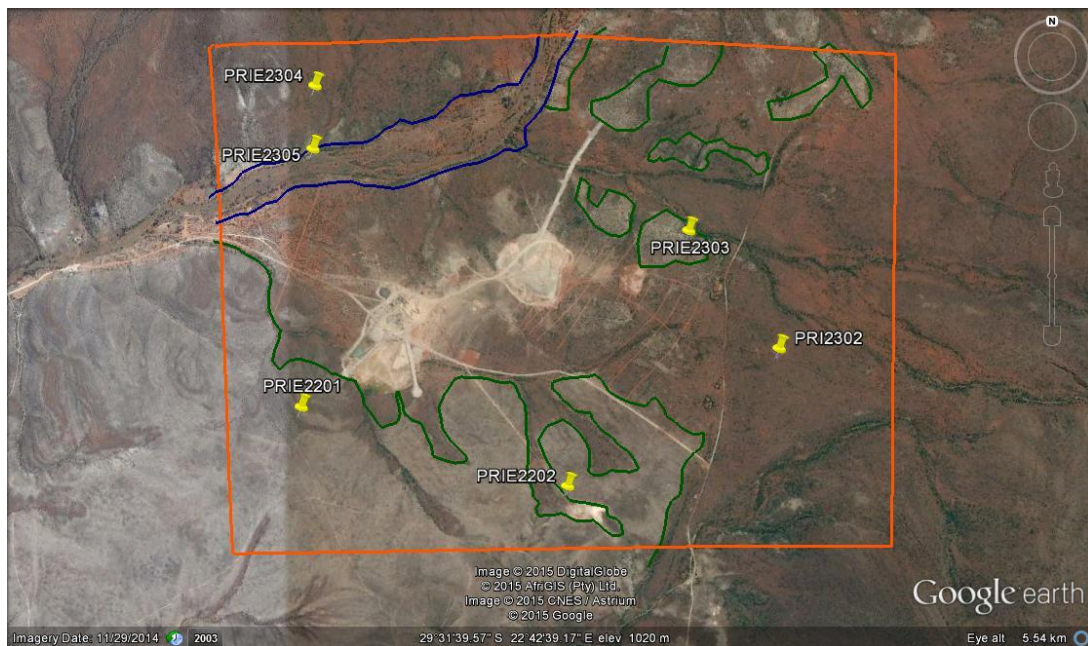


Figure 5: Darker reddish area is the proposed mining area on farms 22 and 23; whiter areas not proposed mining area on farms 22 and 23. Localities of sample plots. Blue line drainage line running through the proposed mining area.

1. The *Senegalia mellifera*-*Rhigozum trichotomum* sparse shrubland



The shrubland most conspicuous shrub is the *Senegalia mellifera*, while the shrub-like *Rhigozum trichotomum* forms dense stands on a shallow (< 0.1m) sandy (wind-blown) substrate, while the poorly developed herbaceous layer is being dominated by the inconspicuous annual grass species *Enneapogon desvauxii* and *Oropetium capense*. The woody layer has a low canopy cover of 10% in the area while the average height of the woody plant species are 1.5m. The herbaceous layer has also a low canopy cover of 5% while the average height of the herbaceous layer is 0.1m. Other woody plant species that were recorded are the following: *Aloe dichotoma* (one single individual), *Boscia albitrunca* (sparse individuals), *Rhigozum obovatum*, *Ziziphus mucronata* (sparse individuals shrub-like), *Ehretia rigida*, *Lycium cinereum*. In the herbaceous layer the following forbs and grass species were recorded: succulents *Aloe claviflora*, *Euphorbia* cf. *hypogaea*, *Hoodia gordonii*, *Kleinia longiflora*, and the conspicuous yellow flower *Zygophyllum* cf. *incrustatum* and the forbs *Aptosimum* species, *Asparagus suaveolens*, *Barleria macrostegia*, *Limeum viscosum*, *Asclepias* cf. *burchellii*, *Osteospermum* species, *Peliostomum leucorrhizum*, *Pentzia globosa*, *Phyllanthus parvulus*, *Plinthus sericeus*, *Pteronia glauca* and *Monechma incanum* and the grass species *Aristida congesta*, *Eragrostis lehmanniana*, *Stipagrostis obtusa* and *Stipagrostis uniplumis*. The semi-parasite *Loranthus* species on the branches of the *Senegalia mellifera* and geophyte *Moraea polystachya* were also recorded (Table 1).

The sparse shrubland has two variants, the one variant with flat rocky outcrops of dolomite, limestone and chert which appear on the google image whitish and the other darker reddish variant on the google earth image with shallow rocky soil consisting of iron formation and jaspillite of the Griquatown Group in which the diamonds occur. The plant species composition is the same in both variants (Figure 5).

The following protected plant species were recorded:

Aloe dichotoma (one single individual): At locality identified for the “Magasyn” GPS position of *Aloe dichotoma*: 29.53146S and 22.698270E. PRIE2201 (Table 1 and Figures 5 & 6).



Figure 6: Habitat (flat dolomite outcrops) and isolated protected *Aloe dichotoma*.

Boscia albitrunca (several small (0.3 – 0.5m tall) individuals) in four of the plots (Table 1 and Figure 7).



Figure 7: One tall isolated *Boscia albitrunca* for identification purposes, the white stem shrub in background out of the survey plot.

Aloe claviflora (several individuals) in four of the plots: conspicuous example GPS: 29, 53076S and 22.716870E.

Hoodia gordonii (isolated individuals) medicinal plant as well as protected. Plot no PRIE2301 GPS: 29.12266S and 24,38683E (Table 1 and Figures 5 & 8).



Figure 8: Left *Hoodia gordonii*, and right *Aloe claviflora*.

Euphorbia cf. *hypogaea* (isolated individuals in plot no PRIE2302 GPS: 29,52893S and 22,72199E)
(Table 1 and Figures 5 & 9).



Figure 9: An individual of *Euphorbia* cf. *hypogaea*

2. The *Ziziphus mucronata*-*Stipagrostis namaquensis* sparse woodland



The dry drainage line of the *Ziziphus mucronata*-*Stipagrostis namaquensis* sparse woodland is being dominated by the woody plant species lining both side of the drainage line with relatively deep (>0.8m) sandy soil in the middle of the drainage area dominated by the tall (>0.1m) *Stipagrostis namaquensis* with a canopy cover of 60%. The conspicuous woody plant species are the dominant *Ziziphus mucronata*, other trees recorded are *Vachellia karroo* and *Searsia lancea*. The shrubs *Rhigozum obovatum* and *Senegalia mellifera* were also recorded. In the herbaceous layer apart from the dominant grass species *Stipagrostis namaquensis*, the following grass species *Aristida congesta*, *Cenchrus ciliaris*, *Enneapogon cenchroides*, *Eragrostis lehmanniana*, *Stipagrostis obtusa* and *Stipagrostis uniplumis* were also recorded. Not many forbs were recorded in the drainage line only *Berkheya spinosissima*, *Codon royenii*, *Lycium* species, *Plinthus sericeus* and *Zygophyllum* cf. *incrustatum* (Table 1).

No declared invader plant species were recorded in the study area. No endemic, rare, and/or endangered plant species were recorded in the study area.

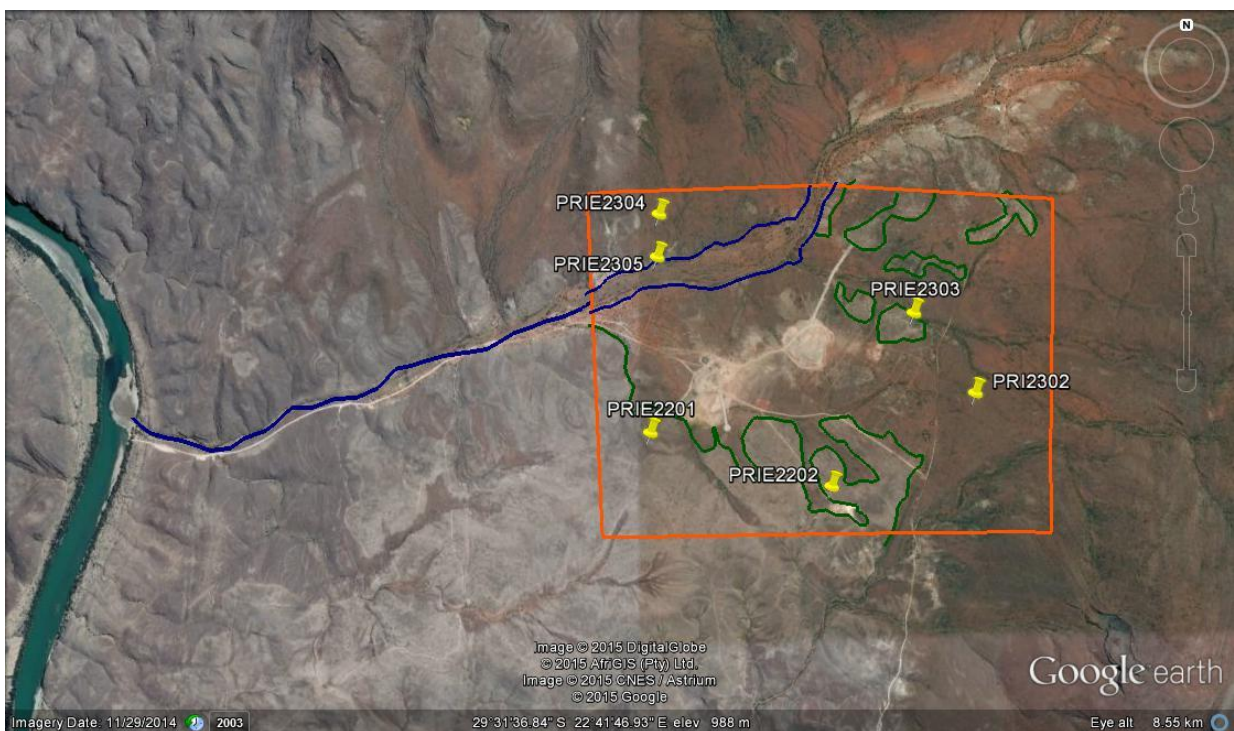


Figure 10: Drainage line that feed into the Orange River – note the already alluvial deposit in the River

Table 1: An alphabetic list of plant species recorded		2301	2302	2303	2304	2305	2201	2202
<i>Aloe claviflora</i>	Kanonaalwyn	+	+	+			+	
<i>Aloe dichotoma</i>	Kokerboom						R	
<i>Aptosimum species</i>	Violtjie						+	+
<i>Aristida congesta</i>	Tree-awn	+	+		+	+		
<i>Asclepias cf. burchellii</i>	Milkbush						+	
<i>Asparagus suaveolens</i>	Katdoring		+					+
<i>Barleria macrostegia</i>	Forb		+	+	+			+
<i>Berkheya spinosissima</i>	Forb					+		
<i>Boscia albitrunca</i>	Shepherd's Tree	+	+	+	+			
<i>Cenchrus ciliaris</i>	Foxtail Buffalo Grass					+		
<i>Codon royenii</i>	Doringstruikie					+		
<i>Ehretia rigida</i>	Puzzle Bush Shrub	+						
<i>Enneapogon cenchroides</i>	Nine-awned Grass					+		
<i>Enneapogon desvauxii</i>	Eight Day Grass	2A	2A	+	2A		+	2A
<i>Eragrostis lehmanniana</i>	Lehmann's Love Grass	+	+			+		+
<i>Euphorbia cf. hypogaea</i>	Melkbos		+					
<i>Hoodia gordonii</i>	Ghaap	+						
<i>Kleinia longiflora</i>	Sambokbos		+					
<i>Limeum viscosum</i>	Forb						+	
<i>Loranthus species</i>	Mistletoe		+					
<i>Lycium cinereum</i>	Kriedoring							+
<i>Lycium species</i>	Wolwedoring					+		
<i>Monechma incanum</i>	Skaapbloubossie				+			
<i>Moraea polystachya</i>	Bloutulp				+			
<i>Oropetium capense</i>	Dwarf Grass	1	+		1		+	1
<i>Osteospermum species</i>	Forb							
<i>Pelostomum leucorrhizum</i>	Veld Violet			+				
<i>Pentzia globosa</i>	Karoo Bush						+	
<i>Phyllanthus parvulus</i>	Dye Bush		+					
<i>Plinthus sericeus</i>	Sandganna			+		+		
<i>Pteronia glauca</i>	Forb	+		+				+
<i>Rhigozum obovatum</i>	Karoo Gold	1	+	+		+		2B
<i>Rhigozum trichotomum</i>	Driedoring	2B	3B	3	2B		1	
<i>Searsia lancea</i>	Karee Tree					+		
<i>Senegalia mellifera</i>	Black Thorn Shrub	2A	1	2B	2B	+	3	2B
<i>Stipagrostis namaquensis</i>	Rivier steekgras					2B		
<i>Stipagrostis obtusa</i>	Small Bushman Grass			+		+		
<i>Stipagrostis uniplumis</i>	Silky Bushman Grass				+	+		
<i>Vachellia karroo</i>	Sweet Thorn Tree					+		
<i>Ziziphus mucronata</i>	Buffalo Thorn Tree		R			2B		
<i>Zygophyllum cf. incrustatum</i>	Witkriedoring	+		1		+	+	
Any number with cover more than 75% of the reference area		5						
Any number with 50 to 75 % cover		4						
Any number with 25 to 50 % cover		3						
Any number with 12 to 25 %		2B						
Any number with 5 to 12 %		2A						
Numerous, but less than 5 % cover, or scattered, with cover		1						
Few, with small cover		+						
Solitary, with small cover		R						

Concluding remarks

Some of the habitat of the study area for proposed mining area is already being disturbed by the current and old mining areas. For me personally the mining activity could be positive for the environment and landscaping of the study area, provided a proper rehabilitation program is drafted and implemented. This will assist the natural ecological processes and patterns of the Northern Upper Karoo to recover.

Exotic and invader plant species were not recorded in the proposed mining area, but *Prosopis glandulosa* shrubs and trees were noted along the Orange River. The Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) was amended in 2001. According to the amendments, which were published in the Government Gazette Vol 429 no 22166, on 30 March 2001, invader or exotic plant species are categorized either as prohibited plant species which must be controlled, or eradicated where possible. All alien plant species should also be eradicated and a plan for such eradication should be incorporated into the Environmental Management Programme report (EMPr).

The rehabilitation must be carried out hand-in-hand with the mining operations. The process and success of any rehabilitation plan will depend on the environmental conditions, especially climate, financial and resource inputs. It is a long-term commitment by all the stakeholders involved. Rehabilitation must run concurrently with mining operations. Erosion and dust control are environmental concerns for the nearby Prieska town. Erosion should be mitigated by developing a plan for run-off water, which is a problem in the study area with thunderstorms part of the climate of the study area.

Another important concern is that the proposal is to mine the drainage line, which if looking at the google earth image, already indicate a major significant impact on the flow of the Orange River (Figure 10). A mitigation plan should be part of the rehabilitation EMPr for current mining activities and also for proposed mining activities.

The ordinance states that a valid permit from Northern Cape Nature Conservation is needed to remove any protected plant species, and this should be done.

No significant botanical or soil reason could be given why the application could not be granted.

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