ASSESSMENT REPORT: Vegetation Impacts

EIA for the proposed upgrade of the Sani Pass Road (Phase 2)

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PROПONENT

LEAD ENVIRONMENTAL CONSULTANT

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1. EXECUTIVE SUMMARY

The Provincial Department of Transport, in association of the National Department of Transport, proposes to continue with Phase 2 of the upgrade of the P318 road up Sani Pass, located in the uKhahlamba Drakensberg Park (World Heritage Site) near Himeville. Phase 1, the upgrade of the lower section of the Sani Pass road (km 0 – km 14) has already been approved and is currently under construction. Phase 2 covers the remaining 19 km section from Km 14 (Good Hope Trading Post) – Km 33 (summit/Lesotho border post).

The project engineers have identified that the degradation of the Sani Pass Road is caused by a number of factors. The main contributor is the poor stormwater drainage system which is unable to cope with the excessive water flows and the run-off which are eroding the surface of the road and the slopes of the Pass. The Environmental Impact Assessment for the Proposed Upgrade of the Sani Pass Road (P318): Phase 2 Scoping Report concluded that the upgrade would include road widening, realignment of sections, new bridges, stormwater control and attenuation systems, bank and slope stabilisation and road servitude rehabilitation. It also identified and described environmental impacts and issues associated with this upgrade that would require further investigation. This Vegetation Assessment Report studied the potential impacts of road construction on the vegetation of the Sani Pass valley.

Within the Maloti-Drakensberg region, the vegetation of the Sani Pass Valley is unique. No other valley has such diversity of plant species. Because of its exceptional diversity, the vegetation of Sani Pass has an international reputation. It is recognised as one of the world’s plant “hot spots” - a centre of plant diversity of global botanical importance. Plant communities on the Pass are mostly restricted by altitude, aspect and geology. Consideration of issues relating to botanical tourism was included in the study due to its close relationship with plants.

A number of site visits have taken place during the preparation period for this report in order to assess and map the Invasive Alien Plant species (IAPs) and the vegetation zones. The author has been leading specialist botanical tours up Sani Pass and into Lesotho since 1994. Plant lists and observations from these tours have been used in the vegetation descriptions as well as a literature search for vegetation descriptions of the area. The preparatory list of species for the area was checked against the latest Red Data Book listings. The impact of construction on vegetation zones was measured against impact criteria ratings. Vegetation zones, view sites and Invasive Alien Plants (IAPs) were mapped on a broad scale.

The assessment found that the upgrade to the road will have significant potentially negative and positive impacts on the vegetation on the roadsides – on the actual plants and on the visual effect provided by the plants. Negative impacts include:

- The potential destruction of all vegetation in the road reserve when the road is widened;
- The potential destruction of vegetation abutting onto the road reserve where the degree of slope requires cutting back or where rubble from widening on the lower side of the road kills off vegetation;
- The stabilisation of the upper hairpin bend area has the potential to destroy much of the very rare vegetation in that area;
- Pedestrians, including botanical tourists, will be adversely affected by increased traffic moving on the Pass at higher speeds;
- Dust from the current road, and increased dust from construction of a new road up the Pass has a negative effect on the vegetation on the roadsides;
- Invasive Alien Plant species can be expected to colonise and expand populations in the disturbed ground in the construction footprint;
- The potential impacts of the road upgrade on the vegetation of Sani Pass could adversely affect botanical tourism, including general tourism, due to the potential destruction of plants on the roadsides including steep slopes and cliffs. The great advantage of Sani Pass as a tourist...
destination is that the (rare and endemic) wild flowers growing on the roadsides, provide a very accessible spectacle for all-comers.

A number of positive impacts/factors and mitigation measures have also been found or are recommended in this report:

- The control of stormwater in the upper hairpin bends would prevent further land slides and effectively also protect plants in that area.
- Monitoring and removal of Invasive Alien Plants (IAPs) during the construction period, as well as dealing with current (and future) infestations, would control future potential impacts and improve the current conditions. The vegetation currently invaded would, in time, be returned to its natural state.
- An all weather road would have no dust at all, with beneficial effects on the vegetation next to the road.
- Construction methods can be adapted to reduce the negative impacts on the vegetation.
- A well resourced vegetation rehabilitation programme needs to be run concurrently with construction. It is particularly important to appoint an experienced rehabilitation consultancy. Few of the rare plants on the Sani Pass have been cultivated before in South Africa so there is a risk attached to the rehabilitation process.
- It is recommended that a hiking trail be designed by Ezemvelo, using the old mule track. It would allow for safe hiking and walking up the Pass once the upgraded road is completed. (Higher speeds and increased traffic will have a negative potential impact on this aspect of tourism and for pedestrians who also walk up and down the Pass).

The negative impacts could be mitigated through effective compilation and implementation of the Operational Phase Environmental Management Programme (EMP), with input from the engineers, specialist consultants and Ezemvelo KZN Wildlife (the management authority of the World Heritage Site). All should carefully consider how the new road up the Pass will be used and how best to ensure safety of pedestrians and hikers, all types of vehicles and the natural environment through measures such as speed limits and warning signs as well as designated parking areas for picnic spots and viewing sites.

It is not possible to do a major road upgrade on a mountain pass in a world heritage site without causing considerable damage to the vegetation along the road, but it is possible to mitigate against some of the damage in a number of ways. Successful mitigation measures require that the road design be adjusted where possible to deal with particularly sensitive vegetation, that there be constant supervision by an Environmental Control Officer, that an Invasive Alien Plant management programme and a well resourced vegetation rehabilitation programme be implemented. In the operational phase, Ezemvelo KZN Wildlife will need to implement a carefully designed management plan for the road and road reserve up the Sani Pass.
2. INTRODUCTION

2.1 Background

The Provincial Department of Transport, in association with the National Department of Transport, proposes to continue with Phase 2 of the upgrade of the P318 road up Sani Pass, located in the uKhahlamba Drakensberg Park (World Heritage Site) near Himeville. Phase 1, the upgrade of the lower section of the Sani Pass road (km 0 – km 14) has already been approved and is currently under construction. Phase 2 covers the remaining 19 km section from Km 14 (Good Hope Trading Post) – Km 33 (summit/Lesotho border post).

The proposed Phase 2 upgrade entails a complete re-grading and resurfacing of the Sani Pass from a gravel to a hardened surface, all-weather road. The Environmental Impact Assessment for the Proposed Upgrade of the Sani Pass Road (P318): Phase 2 Scoping Report concluded that the upgrade would include road widening, re-alignment of sections, new bridges, stormwater control and attenuation systems, bank and slope stabilisation and road servitude rehabilitation. It also identified and described environmental impacts and issues associated with this upgrade that would require further investigation.

The project engineers have identified that the degradation of the Sani Pass Road is caused by a number of factors. The main contributor is the poor stormwater drainage system which is unable to cope with the excessive water flows and the run-off which are eroding the surface of the road and the slopes of the Pass. In addition, the degrading condition increases safety risks on the Sani Pass Road. In order to rectify these problems and prevent further degradation, the EIA Project Team has considered a number of Sani Pass Road upgrade alternatives, which range from retaining the status quo to making minor improvements to the drainage, to reconstructing the entire road structure. Each alternative has been assessed based on a variety of aspects, such as the impact on the environment, tourism, community, road safety and political links. The alternatives are described in order of increasing scale of upgrade from Alternative 1 (the ‘no-go’ alternative and the status quo remains) to Alternative 6 (complete upgrade). The summaries below describe the key aspects for each Alternative.

Alternative 1A: No-Go
The No-Go alternative retains the current status quo where the Sani Pass road is retained as a gravel road with some maintenance and no upgraded stormwater and erosion engineering. No improvements will be made to the drainage system nor will the safety issues be addressed. It has been indicated that this alternative is not feasible in terms of sourcing of materials nor will it address the current environmental and safety issues on the Pass. Without proper engineering on the Pass, the road is likely to continue degrading to a state where the environmental degradation and safety risks are unacceptable and will have to be closed (Alternative 1B). This alternative will not meet any of the DOT’s objectives of the proposed project.

Alternative 1B: Closure of the Pass
The current condition of the road is deteriorating to such a degree that if measures are not taken to rectify the problems the road will be unsafe for public use and will continue to cause significant environmental damage. If no action is taken the road may have to be closed, decommissioned and handed over to EKZNW for rehabilitation and the integration in the UDP. Vehicle or pedestrian traffic will no longer be able to move between Lesotho and South Africa through this route. This alternative will not meet any of the DOT’s objectives of the proposed project.

Alternative 2: Re-gravel, minor drainage improvements and maintain
The second option is to make minor improvements to the drainage system. Although this will not address the water problem per se, it may slow down the flow of water. The road will remain a gravel surface and be maintained regularly. Degradation of the road will continue as the cause of the erosion has not been corrected. This alternative will not meet the DOT’s objectives of the proposed project.
Alternative 3: Improve geometrics, upgrade drainage, retain splash-throughs, construct retaining walls and re-gravel
The third alternative is to improve the structure of the road, upgrade the drainage system so that the splash-throughs are still retained, and construct retaining walls. The construction will allow the road to retain its original state but the factors which are causing the degradation will be addressed. The road surfaced will be graded, re-gravelled and maintained on a regular basis. This alternative will not meet all of the DOT’s objectives of the proposed project.

Alternative 4: Improve geometrics, upgrade drainage, construct bridges, retaining walls, hard surface up to km 25, gravel to km 33
Alternative 4 will address the same issues as Alternative 3 regarding improving the geometrics of the road to control the drainage and erosion. A hard surface will be constructed for the first portion of the road, up to km 25, and the remaining section, to km 33, will remain as a gravel surface and be maintained on a regular basis. The most appropriate type of hard surface has not been resolved as yet. This alternative will meet most of the DOT’s objectives of the proposed project.

Alternative 5: Improve geometrics, upgrade drainage, construct bridges and retaining walls, hard surface from km 14 to km 33.
Alternative 5 has been expressed as the preferred alternative for the project by the proponent. This option involves improving and re-constructing all the geometrics of the road as in Alternatives 3 and 4 but includes hard surfacing the entire road. The hard surface will either be a concrete surface, asphalt or chip and spray, or a combination of the three depending on the section of Road. This alternative will meet all the DOT’s objectives of the proposed project.

Alternative 6: Improve geometrics, upgrade drainage, construct bridges and retaining walls, hard surface from km 14 to km 31 and tunnel (3 km)
Alternative 6 involves improving and reconstructing the geometrics of the road to control water run-off and erosion and constructing a hard top surface from km 14 to km 31. A tunnel will then be constructed though the mountain from km 31 and will exit 3 kms into Lesotho. This alternative will not meet all the objectives of the proposed project.

The Department of Transport’s preferred alternative is Alternative 5. Alternatives 1a, 1b, 2 and 6 are not being considered. Alternatives 3-6 all have similar potentially negative impacts on the vegetation along the road.

2.2 Objectives of the study
To determine the potential impact of the Sani Pass road upgrade on the adjacent vegetation.

2.3 Terms of reference
- Map the vegetation showing the following:
  - The area to be potentially impacted by the proposed development
  - The location of vegetation, habitat and spatial components of ecological processes that should not be developed or otherwise transformed
  - Areas, including the site and surrounds that must remain intact as corridors or ecological ‘stepping stones’
- Assess whether the site or neighbouring properties potentially contribute to meeting regional conservation targets for both biodiversity patterns and ecological processes, and if so, indicate on a topographical map the recommended actions that should be taken to prevent or, if prevention is not feasible, to mitigate potential impacts and restore disturbed vegetation or ecological processes. Indicate how preventative and remedial actions will be scheduled to ensure long-term protection, management and restoration of affected ecosystems and biodiversity.
- Indicate limitations and assumptions, particularly in relation to seasonality
- Assess and map Invasive Alien Plants (IAPs)
• Identify any significant landscape features or rare or important vegetation associations which might be affected.

• Produce guidelines for the Environmental Management Programme (EMP) including the following:
  - Management of the road reserve including a management plan for Invasive Alien Plants
  - Protection of key viewing areas
  - Selection of turning areas and storage areas, in discussion with contractors
  - Vegetation rehabilitation plan, including plant rescue project

3 STUDY AREA - VEGETATION

The dominant vegetation physiognomy of the Maloti-Drakensberg region is high altitude grasslands and dwarf scrub and scattered patches of afro-montane forest in fire-protected valleys. Wetland communities are scattered along drainage lines and moister slopes, but are concentrated in the alpine region. These high altitude wetland systems support several endemic species.

Altitude, climate, aspect, latitude and geology are important determinants of species composition and physiognomic patterns in the region. The vegetation is broadly defined as follows:

- Alpine: ± 2800-3400m
- Sub-alpine: ± 1800-2800m
- Montane: below 1800m

Within these altitudinal zones, the following broad vegetation types can be found: grasslands, vegetation dominated by woody plants, cliffs, rivers and wetlands below the escarpment, summit

Within the Maloti-Drakensberg region, the vegetation of Sani Pass is unique. Because of its exceptional diversity the Pass has an international reputation as one of the top alpine botanical tour destinations in Africa, and certainly in southern Africa. This is the only place in the entire Drakensberg where a road pass reaches from the foot of the mountains onto and over the summit of the escarpment. While the road has made the Sani valley more accessible for plant exploration, of greater importance is the fact that no other valley has such diversity of plantlife.

The flora of these high mountains has recently been recognized as one of the world’s ‘hot spots’, a centre of plant diversity of global botanical importance. The dramatic broken landscape of the Drakensberg escarpment and the harsh climatic conditions on the highlands of Lesotho account for the remarkably diverse plant life with about 2200 species and almost 400 endemics (plants found only in this area and nowhere else in the world). It is known as the Eastern Mountain Region (EMR) or the Drakensberg Alpine Centre (DAC). For the purposes of this document it will be referred to as the EMR.

Perhaps the most outstanding topographical feature of the southern Berg is the Sani Pass Valley. Certainly its rich flora makes it of pre-eminent importance to the botanist.

The vegetation of the Drakensberg, of which Sani Pass is a part, is highly heterogeneous, composed of differing or unrelated elements. The differences in the detailed composition of the flora between two neighbouring valleys running almost parallel to one another may be quite striking, and no two valleys are really alike. The plants may differ with every fold of the mountains, with every change in altitude, aspect, drainage and rock type, from one valley or mountain peak to the next, clinging to cracks in rock faces, taking hold in basalt gravels or floating in shallow rock pools on the summit.

\[1\text{ (Nüsser 1999)}
\[2\text{ Ambrose and Talukdar 1999}
\[3\text{ Klug et al. 1991}
\[4\text{ pers comm.. Dr O M Hilliard}
The area assessed comprised a ‘corridor’ on either side of the existing road up Sani Pass. This included the expected construction footprint and land sloping into or away from it which might also be affected by construction. This ‘corridor’ averages about 50m on either side of the road but can be much wider around rivers, streams, wetlands, cliffs and places of particular botanical interest.

4 METHODS

4.1 Field Studies

The author has been visiting Sani Pass since the 1960s. She has been leading botanical tours and wild flower walks on the Pass and into Lesotho since 1998. Plant lists were recorded for these tours and walks.

For the purposes of this study, a number of additional trips up the Sani Pass were completed to record Invasive Alien Plants and to mark the changes in vegetation zones.

4.2 Study Conditions

The field trips were conducted in summer, between the months of October and March, when the plants are most easily identified i.e. in full leaf, flower and/or fruit. Observations were backed up by a photographic record, particularly of the IAPs.

4.3 Assumptions, limitations and constraints

The following assumptions, limitations and constraints apply to this study:

- The Assessment is focused primarily on the Construction Phase when most if not all impacts will occur and therefore only calculates construction activity impact significance (with and without mitigation).
- The study area has been limited to the road reserve and immediate surrounds, except where access to sites of particular botanical significance will be affected by construction work.
- The basis for this assessment is that the plants of the Sani Pass region are of international, regional and local significance.
- The Department of Transport’s preferred alternative is Alternative 5. Alternatives 3-6 will all have some potentially negative impacts on the vegetation along the road due to stabilisation of banks and road widening.
- Within the construction path, areas of particular botanical significance and/or of particular significance to the tourists visiting the Sani Pass, have been flagged on a map. Most of these areas are well known and used by tour operators conducting both general and botanical tours.
- It is important that all preparations for plant rescue and seed collection, ahead of construction, be implemented between September and April each year. Careful discussion with the botanical consultant and rehabilitation contractor and construction contractor could allow some work to proceed in between May and August, depending on what activity is to take place.
- It is understood that there will be no construction activity other than the actual road construction on the flat area between the summit of Sani Pass and the Lesotho border post.
- The vegetation zones were considered separately and implications for each assessed for the proposed construction.
- Invasive Alien Plants were mapped so that possible future invasions due to construction can be anticipated and prevented, during and after construction.
- Botanical tourism is included in this report because it is so closely associated with the state of the vegetation on the Sani Pass. Botanical tourism on the Pass offers excellent plant viewing on the roadside itself. People do not have to be mountaineers to be able to get up close to rare species which are found on the roadsides. This applies particularly to the upper reaches of the Pass where the valley is very narrow and easily observed from the road.
5. DESCRIPTION OF THE AFFECTED ENVIRONMENT

5.1 Vegetation

The Montane and Sub-alpine grasslands cover about 85% of the area. Forest, fynbos and scrub ecosystems form small patches within the grassland and, together with the Alpine and aquatic ecosystems, make up about 15% of the vegetation. The Alpine belt has a harsh climate, with intense solar radiation, high evaporation and low average temperatures with more stunted vegetation and lower abundance of species. Many of the species at the lower altitudes, with milder climate, grow denser and taller, in greater abundance than in the alpine region.

5.1.1 Grasslands

Although categorised as grasslands, the species of plants within the grasslands vary greatly according to aspect, altitude and geology. Major changes in species composition are indicated on the map. With this in mind, care must be taken throughout this vegetation type to rescue and replace topsoil and plants as close as possible to where they originated. The botanical consultant will also advise where there are particular landmark species which can be rescued and re-established as close as possible to the original locality.

Fire is a natural feature of the Drakensberg grasslands. It removes dry plant material, allows new growth of grasses and triggers germination in many herbaceous plants and bulbs/corms. Many plants which cannot survive fire are found in ‘refuge’ sites e.g. around boulders, rocky streambeds, rock sheets and cliffs.

High rainfall (causing leached soils), low temperatures and frost have a limiting effect on productivity in the mountain grasslands. This is further limited by the short growing season which is even shorter at the highest altitudes.

Montane Grasslands below 2000m (below the current RSA border post)

Grasslands below 2000m are fairly homogenous. However, there are changes in the species composition of associated plants and grasses e.g. *Protea dracomontana* dominates the grassland in certain areas and *Watsonia socium* in others.

Alpine Grasslands from 2000m to the summit

In grassland from 2000m to the summit, tussuck and tufted grasses are more common, and are dominated by a number of shrubby species, most of which are rare or local endemics. Above 2000m, tussuck grass *Merxmuellera macowanii* and smaller tufted species of *Festuca* and *Aristida* are more common. From 2100m to near the summit, species of *Helichrysum*, *Euryops*, *Erica* and *Passerina* dominate the valley scrub or fynbos.

5.1.2 Vegetation Dominated By Woody Plants

*Protea savanna*

*Protea savanna* with *Protea caffra* and *Protea roupelliae* dominating, is found up to 2375m. These species are fire resistant and quite widespread.

*Protea subvestita*

*Protea subvestita* (‘vulnerable’ on the Red Data list) is fire sensitive and is mostly restricted to boulder beds and other areas offering protection from fire. Sani Pass is one of the few places in the Drakensberg where the public can see fine stands of this species easily.

*Forest patches*

There are very few forest patches along the Sani Pass road. This means that the small clump of Yellowwoods *Podocarpus latifolius* (‘specially protected’ on the Red Data list) and other trees at the
The ‘giant boulder’ corner is a particularly special feature of the Pass. Every effort should be made to retain this feature i.e. neither the boulders nor the *Podocarpus* trees should be affected by construction.

**Ouhoud Leucosidea sericea**  
This plant is found in almost pure stands in places and as a component of vegetation from the foot of the Sani Pass to about 2500m, particularly in grassland and along floodplain areas. The height of the stands ranges from about a metre, up to 3m tall. This species can be an indicator of overgrazing and too frequent fires. The biggest stands are found where mule trains used to graze at the foot of the Pass and at the old border post, closer to the summit. Despite its invading potential, it is also a natural and useful part of the ecosystem.

### 5.1.3 Boulder beds

These are a distinctive feature along river and stream valleys. The mixed boulder-bed scrub is made up of a variety of species, depending on the strength of seasonal flooding and depth of soil. *Leucodisea sericia* dominates. Others species are *Buddleja salviifolia*, *Buddleja loricata*, *Protea subvestita*, *Erica caffrorum*, *Rhus dentata*, *Calpurnia sericea*, *Lotononis* spp., *Euryops* spp., *Geranium* spp., *Cephalaria* spp., *Macowania* spp., *Crassula* spp., *Senecio* spp. and *Helichrysum* spp.

**Riverine Systems and Wetlands**

**Streams**

Streams descending at a steady angle of slope have a few characteristic species which differ depending on altitude. In areas of little or no slope, small marshes are formed, with attendant species of plants.

**Rivers**

Deeper soils often allow growth of taller forest precursor scrub including *Bowkeria verticellata*, *Halleria lucida*, *Rhamnus prinoides* and, at lower altitudes, *Salix woodii*, the wild willow. However, the effects of seasonal flooding prevent growth of seedlings too close to the banks.

**Wetlands**

Wetlands are mostly found in valley bottoms. The vegetation is mainly made up of sedges and grasses, as well as species such as *Melasma scabrum*, *Gunnera perpensa*, *Afrotysonia glochidiata* and others. The most important wetland, from a tourism and biodiversity point of view, is the *Kniphofia linearifolia* or Red-hot-poker marsh (Site no. 6, map no. ?) which is over a hectare in extent. The red and yellow flowerheads (in early February each year) provide food for many bird species with up to 40 pairs of malachite sunbirds observed at the site when the plants are in full bloom.

Wetlands act as a sponge, slowing down the flow of water in summer, trapping sediments and releasing water below. The rich nutrients trapped support a range of plant species restricted to this vegetation type.

### 5.1.5 Cliffs

Cliffs form a special and conspicuous habitat and also a fire refuge zone, providing varied habitats for specially adapted plants. Some plants grow in cracks and crevices, others on cliff ledges and in larger pockets where soil and plant debris (mulch) accumulates. Most plants are either subshrubs or very dwarf cushion-forming shrubs with a hard woody base. Many of the plants which grow here also grow on the surrounding steep mountainsides, but some are restricted to the cliff faces such as *Gladiolus flanaganii*, *Galtonia regalis*, *Euryops acraeus* and *Erica frigida* (Map sites 11, 26 and 29).

### 5.1.6 Summit Plateau

The vegetation on or near the summit comprises a very restricted area in South Africa, just inside the Lesotho border post. Although this area appears degraded, overgrazed and eroded, it is home to a number of species not listed in South Africa, endemic to the high altitude areas of Lesotho.
5.1.7 Old Borrow Pits and Old Quarries on Sani Pass
These sites, particularly above the South African border post, have been revegated naturally over time and the plants include interesting species not easily viewed elsewhere in South Africa outside of the eastern mountain region and southern Drakensberg in particular eg *Diascia* spp, *Lotononis* spp, *Jamesbrittenia* spp, *Sutera* spp. Loose gravels provide a perfect habitat for certain species which will not easily grow in more stable environments.

5.2 Potentially Affected Significant Landscape Features and Rare and Endemic Plants
The following vegetation zones and landscape features require special attention (see Maps 1-12). The numbers on the map mark the general site, not the extent of the vegetation mentioned:

1. GOOD HOPE STORE  
   *Gladiolus oppositiflorus*

2. RIVER VIEW  
   *Gomphostigma virgatum*

3. CHRISTMAS BELLS BUSH  
   *Sandersonia aurantiaca* (in *Leucosidea* thicket along low lying road below cliff)

4. VIEWING POINT / PROTEA VELD  
   *Protea caffra*  
   *Protea roupelliae*  
   *Watsonia socium* [= *W. pillansii*]

5. BIG BOULDER/CHRISTMAS BELLS CORNER  
   *Podocarpus latifolius*  
   *Sandersonia aurantiaca*  
   *Pterygodium* spp.
6. STREAM CROSSING BELOW KNIPHOFIA MARSH

7. RED-HOT-POKER/KNIPHOFIA MARSH  
   Kniphofia linearifolia  
   Protea dracomontana

8. VIEWING SITE

9. CASCADE WATERFALL

10. BORDER POST  
    Pterygodium magnum  
    Scilla natalensis  
    TREES  
    Cussonia paniculata  
    Kiggelaria africana  
    Rhamnus prinoides  
    Rhus dentata  
    Euclea crispa

11. RIVER CROSSING

12. LOWER BASALT GLADIOLUS / EUCOMIS CLIFFS  
    Eucomis schijffii  
    Gladiolus flanaganii  
    Protea dracomontana  
    Scilla natalensis

13. TWINSTREAMS  
    Cyrtanthus epiphyticus  
    Eucomis schijffii  
    Euphorbia clavaroides  
    Euryops tysonii  
    Helichrysum sessiloides  
    Helichrysum tenuifolium  
    Holothrix grandiflora  
    Myosotis semiamplexicaulis  
    Satyrium parviflorum  
    Streptocarpus pusillus
14 AGAPANTHUS HILLSIDES  
Agapanthus campanulatus subsp. patens  
Protea subvestita

15. PROTEA SUBVESTITA

16. EUCOMIS BANK  
Berheya purpurea  
Eucomis humilis

17. VIEWING SITE

18. LEUCOSIDEA SERICEA, BERKHEYA PURPUREA, STREAM

19. ERICA CORNER VIEWING SITE  
Aristea spp.  
Corycium spp  
Erica spp.  
Lotononis pulchella
20. STREAM CROSSING

21. WILDFLOWER LUNCH SITE

- *Disa oreophila*
- *Helichrysum dracomontanum* (Rare)
- *Lotonomis sericophylla*
- *Sutherlandia montana*

22. LEUCOSIDEA SERICEA SLOPES

23. QUARRY

- *Diascia spp.*
- *Selago galpinii*
- *Jamesbrittenia pristisepala*

24. STREAM-CROSSING & GERANIUM PULCHRUM SLOPES

- *Helichrysum tenuifolium*
- *Euryops tysonii*
- *Geranium pulchrum*
- *Glumicalyx goseloides*
- *Peucedanum thodei*

25. EURYOPS EVANSII SLOPES

- *Euryops evansii*

26. ORCHID CORNER

- *Aster erucifolius*
- *Athrrixia montana*
- *Berkheya multijuga*
- *Brownleea galpinii*
- *Brownleea macroceras*
- *Cyrtaanthus flanaganii*
- *Disa dracomontana*
- *Disa oreophila subsp. oreophila*
- *Dracomonticola virginea*
- *Huttonaea grandiflora*
- *Pterygodium cooperi*
27. BASALT CLIFFS

*Gladiolus flanaganii*
*Holothrix scopularia*
*Urginea macrocentra* (on slopes)

28. SENECIO MACROSPERMUS

29. STEEP UPPER SLOPES ON ZIGZAGS

*Cephalaria galpiniana* var. *simplicior*
*Dierama dracomontanum*
*Senecio macrosppermus*

30. TOP ZIGZAGS – ON CLIFFS

*Alepidea thodei*
*Dianthus basuticus*
*Euryops acraeus*
*Geranium drakensbergense*
*Glumicalyx flanaganii*
*Lobelia preslii*
*Wahlenbergia pulvillus-gigantis*
31. SUMMIT FLATS, found in seasonal pools and seeps

- *Cotula paludosa*
- *Haplocarpha nervosa*
- *Hesperantha baurii* subsp. *formosa*
- *Limosella vesiculosa*
- *Lobelia galpinii*
- *Ranunculus meyeri*
- *Romulea thodei*

5.3 Invasive Alien Plants

Disturbed ground is quickly colonized by invasive alien plants. This is apparent on the lower reaches of the Pass where there is heavy infestation of wattle and *Cotoneaster* berry bushes as well as American bramble in particular. This is due to past practices of heavy grazing from stock and from the mule trains from Lesotho before the road was constructed up the pass. Some of it is also due to garden escapes from farm houses, trading stores etc.

The upper reaches of the Pass are relatively free of alien plants. The more extreme climatic conditions make it inhospitable for the extremely invasive species found on the lower reaches. However, high altitude weeds, particularly from the northern hemisphere are moving in from the Lesotho side of the border along the road, and others, from the base of the Pass in South Africa. Hilliard & Burtt have
listed a large number of alien species found up Sani Pass, considered to have followed the road. Any disturbed ground is a potential problem area with possible negative effects on the biodiversity of the area.

The current populations of IAPs have been identified and photographed on either side of the road up the Pass. See Appendix B.

**Some of the most problematic alien invasive species recorded (mostly below 2000m)**

- Acacia mearnsii Wattle
- Pyracantha spp. Fire-thorn
- Cotoneaster spp
- Rubus cuneifolius American bramble

Other weeds occurring on or near the roadsides

- Avena fatua
- Bromus unioloides
- Juncus tenuis
- Lepidium bonariense
- Oenothera rosea
- Plantago lanceolata
- Polygonum arenastrum
- Fallopia convolvulus
  
  [= Polygonum convolvulus]
- Taraxacum spp.
- Trifolium repens
- Vulpia myuros

Pussy willow
Weeping willow
Salix fragilis Crack willow
Hypericum patulum St. John’s Wort
Saligna spp. Gum trees
Pinus spp. Pine trees
Dahlias
Rambling rose
Cypress
Gum trees on the Sani Pass road near the old Good Hope Trading Post

Mkhomazana Lodge plantations viewed from the Sani Pass road
6 VEGETATION ASSESSMENT

Road construction will affect the vegetation within the construction area on either side of the existing road. Plants will be at risk either by being buried under rubble or by blasting and/or excavation to widen or straighten the road. It will be difficult to avoid additional erosion and spreading of rubble over a much larger area due to the steep terrain and fierce storms. Securing banks and cliffs with concrete or similar materials will damage existing plants and make rehabilitation of the vegetation difficult.

The potential impacts of construction on separate vegetation communities on Sani Pass have been assessed as follows:

6.1 Grasslands

Although categorised as grasslands, the species of plants within the grasslands vary greatly according to aspect, altitude and geology.

6.1.1 Grasslands below 2000m

Grasslands below 2000m are fairly homogenous. The construction footprint, on either side of the road, will have a limited potential impact on ecological processes and biodiversity. Road widening, altering slope on both sides of road will take place throughout this vegetation type.

Potential impacts:
The grassland vegetation will be damaged by road widening which will take place throughout this vegetation type. However, because the valleys are wider at lower altitudes, the potential impact of construction below the current border post can be more easily managed.

Mitigation:
- The construction footprint must be fenced off to prevent construction vehicles from damaging any vegetation outside the footprint. Vehicle tracks can take years to rehabilitate at higher altitudes.
- Construction personnel must be restricted to the construction zone only, unless accompanied by a nature conservation officer
- A plant rescue plan must proceed at least 2-4 weeks prior to construction, with careful removal of plants, topsoil (removed as sods) and collection of seed and natural mulch from the adjacent grassland (under supervision of Ezemvelo KZN Wildlife and the ECO – see Section 9.4 Vegetation Rehabilitation Plan)
- Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>The grassland vegetation will be damaged by road widening</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to local area, and, in places, to the region</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration+Extent+Magnitude x Probability</td>
<td>55</td>
<td>16</td>
</tr>
</tbody>
</table>

RANKING NEGATIVE MODERATE LOW

6.1.2 Grasslands from 2000m to the summit

In grasslands from 2000m to the summit, tussuck and tufted grasses are more common. A number of shrubby species are prominent, most of which are rare or local endemics.
Potential impact:
Construction will require road widening and stabilisation of steep banks and cliffs. This will destroy the vegetation which includes many endemic and rare plants in this high altitude grassland, making it even more important to handle construction options with care.

Mitigation:
The construction footprint must be fenced off to prevent construction vehicles from damaging any vegetation outside the footprint. Construction personnel must be restricted to the construction zone only, unless accompanied by a nature conservation officer.

A plant rescue plan must proceed at least 2-4 weeks prior to construction, with careful removal of plants, topsoil (removed as sods) and collection of seed and natural mulch from the adjacent grassland (under supervision of Ezemvelo and the ECO see 9.4 Vegetation Rehabilitation Plan.) Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Road widening and stabilisation of steep banks and cliffs will destroy the vegetation including many endemic and rare plants in this high altitude grassland</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to local area, the region and, in places, to the national and international</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Magnitude</td>
<td>High (processes altered to extent that they temporarily cease)</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration+Extent+Magnitude x Probability</td>
<td>70</td>
<td>36</td>
</tr>
<tr>
<td>RANKING</td>
<td>NEGATIVE</td>
<td>HIGH</td>
<td>MODERATE</td>
</tr>
</tbody>
</table>

6.2 Vegetation Dominated by Woody Plants

All trees should be considered sensitive in this mountain region. The following tree-dominated vegetation types will be affected by construction:

6.2.1 Protea savanna

*Protea* savanna with *Protea caffra* and *Protea roupelliae* dominating, is found up to 2375m. These species are fire resistant and quite widespread.

Potential impact:
Construction will require road widening and altering of slope on both sides of road. This will take place throughout this vegetation type and will cause considerable destruction of vegetation. Trees will be removed and cannot be transplanted. Re-establishing trees will be a long slow process.

Mitigation:
The construction footprint must be fenced off to prevent construction vehicles from damaging any vegetation outside the footprint. Vehicle tracks can take years to rehabilitate at higher altitudes. Construction personnel must be restricted to the construction zone only, unless accompanied by a nature conservation officer.

A plant rescue plan must proceed at least 2-4 weeks prior to construction, with careful removal of plants, topsoil (removed as sods) and collection of seed and natural mulch from the adjacent grassland (under supervision of Ezemvelo and the ECO - see Section 9.4 Vegetation Rehabilitation Plan.) *It will not be possible to successfully move trees.*
As soon as the final surface of the road and surrounds has been completed, rehabilitation must proceed.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Construction will cause considerable destruction of vegetation including trees which cannot be transplanted.</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to local area and to the region</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration + Extent + Magnitude x Probability</td>
<td>60</td>
<td>20</td>
</tr>
<tr>
<td>RANKING</td>
<td>NEGATIVE</td>
<td>MODERATE</td>
<td>LOW</td>
</tr>
</tbody>
</table>

**Protea subvestita**

*Protea subvestita* (‘vulnerable’ on the Red Data list) is fire sensitive and is mostly restricted to boulder beds and other areas, such as roadsides, which offer protection from fire. Sani Pass is one of the few places in the Drakensberg where the public can see this species easily.

**Potential impact (Map site 15 and other sites):**
The roadsides offer protection from fire and *Protea subvestita* has colonised many places along the road. The best example can be seen in the Twinstreams area (Map site 15). Road widening will destroy many trees.

**Mitigation:**
A good stock of young plants should be built up, ready for rehabilitation in due course. This will be a slow process, starting with seed collection.

Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Road widening will destroy many <em>Protea subvestita</em> trees which use the roadside as a fire refuge.</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the region, national (international)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Magnitude</td>
<td>High – processes are altered to the extent that they temporarily cease</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration + Extent + Magnitude x Probability</td>
<td>70</td>
<td>24</td>
</tr>
<tr>
<td>RANKING</td>
<td>NEGATIVE</td>
<td>HIGH</td>
<td>LOW</td>
</tr>
</tbody>
</table>

**6.2.3 Forest patches**

There are very few forest patches along the Sani Pass road. This means that the small clump of Yellowwoods *Podocarpus latifolius* (a ‘specially protected’ species) and other trees at the giant boulder corner is a particularly special feature of the Pass. This landmark should not be altered in any way in which the boulders or *Podocarpus* trees could be affected.

**Potential impact (Map site 5):**
Potential blasting of rocks to widen road. This would destroy a landmark landscape feature as well as a rare example of high altitude trees and *Sandersonia aurantiaca* Christmas Bells, a ‘declining species’, known to be found at this locality and photographed by countless tourists over the years.
Mitigation:
- The road should either be narrowed at this point or constructed by hand to ensure that the width can be achieved between the boulders. Once this is done, any herbaceous plants such as Christmas bells can be re-planted. The Yellowwoods should be protected from any damage during construction.
- Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Potential blasting of rocks to widen road would destroy a landmark landscape feature as well as a rare example of high altitude trees and \textit{Sandersonia aurantiaca} Christmas Bells, a ‘declining species’</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Highly probable</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the local area and, in places, to the region</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration + Extent + Magnitude x Probability</td>
<td>44</td>
<td>27</td>
</tr>
<tr>
<td>RANKING</td>
<td>NEGATIVE</td>
<td>MODERATE</td>
<td>LOW</td>
</tr>
</tbody>
</table>

6.2.4 Ouhoud \textit{Leucosidea sericea} scrub

This plant is found in almost pure stands and as a component of vegetation from the foot of the Pass to about 2500m, particularly in grassland and along floodplain areas. The height of the stands range from about a metre, up to 3m tall. This species can be an indicator of overgrazed and overburnt veld. Despite its invading properties, it is also a natural and useful part of the ecosystem. The biggest stands are found where mule trains used to graze at the foot of the Pass and at the old border post, closer to the summit.

Potential impact:
The Ouhout is very common. Only the subshrubs, forbs and geophytes found in the undergrowth, which vary in species composition depending on altitude and aspect, could be adversely affected by construction.

Mitigation:
- As per rehabilitation methods below.
- \textit{Leucosidea sericea} and \textit{Buddleja salviifolia} are both easy to cultivate and useful plants for rehabilitation. They are very hardy, frost- and wind-resistant.
- Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>The shrubs, forbs and geophytes found in the undergrowth of the \textit{Leucosidea sericea} scrub could be adversely affected by construction.</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Duration</td>
<td>Short duration: 2-5 years - Medium term: 5-15 years</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the local area</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration + Extent + Magnitude x Probability</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>RANKING</td>
<td>NEGATIVE</td>
<td>MODERATE</td>
<td>LOW</td>
</tr>
</tbody>
</table>
6.3 Boulder Beds

These are a distinctive feature along rivers and stream valleys. The mixed boulder bed scrub is made up of a variety of species, depending on the strength of seasonal flooding and depth of soil. To the uneducated eye, it might appear to be so disturbed as not to require sensitive rehabilitation but in fact, many of the species are endemic or rare and confined to this fragile environment.

**Potential negative impact:**
Construction of river crossings and widening of the road will damage or destroy this vegetation type in many places. In addition, it is possible that in retaining the new roadside banks, this habitat will be reduced.

**Mitigation:**
- A number of the plant species are particularly common in- and adapted to the loose, changeable, boulder-bed environment. Care must be taken to ensure that rehabilitation after construction recreates the effect of loose boulders, gravel and shallow and deep soils.
- Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Description</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the local area and, in places, to the region and national</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration + Extent + Magnitude x Probability</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>RANKING</td>
<td>NEGATIVE</td>
<td>MODERATE</td>
<td>LOW</td>
</tr>
</tbody>
</table>

6.4 Riverine Systems and Wetlands

**Potential impacts:**
Many of the streams, rivers and wetlands will have construction running through or over them. The Aquatic Assessment undertaken by Groundtruth as part of the EIA has dealt with the potential impacts in more detail, as well as how to mitigate against these negative potential impacts. Any undue siltation or diversion of water could have immediate potential impacts on the species composition of the vegetation.

**Mitigation:**
- Construction of the road through marshes, streams and rivers must be carefully designed to ensure that soil and moisture regimes are not altered. Any change could affect the composition of the vegetation.
- Rehabilitation must be carefully managed to ensure that only the species originally found in each wetland are used. The species will vary according to substrate, altitude and aspect.
- Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed.
6.4.1 Streams

Construction of the road through or over streams could alter the moisture regimes altering the composition of the vegetation.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>2</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the region, and in places, national</td>
<td>3</td>
</tr>
<tr>
<td>Magnitude</td>
<td>High – processes are altered to the extent that they temporarily cease</td>
<td>8</td>
</tr>
</tbody>
</table>

Score calculated as: \[ \text{Significance points} = \text{Duration} + \text{Extent} + \text{Magnitude} \times \text{Probability} \]

RANKING: NEGATIVE

6.4.2 Rivers

Construction of the road through or over rivers could alter the moisture regimes altering the composition of the vegetation.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the local area and, in places, to the region</td>
<td>2</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
</tr>
</tbody>
</table>

Score calculated as: \[ \text{Significance points} = \text{Duration} + \text{Extent} + \text{Magnitude} \times \text{Probability} \]

RANKING: MODERATE

6.4.3 Wetlands

Construction of the road through or over wetlands could alter the moisture regimes altering the composition of the vegetation.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
</tr>
<tr>
<td>Duration</td>
<td>Short duration: 2-5 years - Medium term: 5-15 years</td>
<td>2</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the local area and, in places, to the region</td>
<td>2</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
</tr>
</tbody>
</table>

Score calculated as: \[ \text{Significance points} = \text{Duration} + \text{Extent} + \text{Magnitude} \times \text{Probability} \]

RANKING: MODERATE

6.5 Cliffs

Cliffs form a special and conspicuous habitat and also a fire refuge zone. They provide varied habitats for specially adapted plants. Many of the plants which grow here are restricted to the cliff faces. The cliffs in the upper zigzag (high altitude) section of the road have the highest concentration of rare and endemic species.

Potential impacts (Map sites 12, 27, 29)

In the upper regions, blasting or breaking the rock, especially the basalt, will displace important, rare and endemic plant species. Shotcreting, if not done with extreme care and attention to local detail, will remove an important habitat from the Pass.

Mitigation:
- Wherever possible, cliffs should be left untouched. They are particularly important habitats for a number of rare and endemic species.
- Where cliffs fall within the construction line, the system of blasting or breaking rock should attempt to recreate cracks, crevices and ledges similar to those found originally. (Make a photographic record before blasting).
- Shotcreting must similarly only be done in such a way as to provide the same microhabitats as mentioned above. Vegetation rehabilitation of these places will be very specific as to species (see 9.4 Vegetation Rehabilitation Plan).

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Blasting or breaking the rock, especially the basalt, will displace important, rare and endemic plant species.</th>
<th>Score</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Duration</td>
<td>Short duration: 2-5 years - Medium term: 5-15 years, long term &gt;15 years</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the local area, the region, national and international</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, high (processes are altered to the extent that they temporarily cease) to very high (complete destruction of patterns and permanent cessation of processes)</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration + Extent + Magnitude x Probability</td>
<td>75</td>
<td>39</td>
</tr>
<tr>
<td>RANKING</td>
<td>NEGATIVE</td>
<td>HIGH</td>
<td>MODERATE</td>
</tr>
</tbody>
</table>

### 6.6 Summit Plateau

The vegetation on or near the summit comprises a very restricted area in South Africa, just inside the Lesotho border post. Although this area appears degraded, overgrazed and eroded, it is home to a number of species not listed in South Africa, endemic to the high altitude areas of Lesotho.

**Potential impact (Map site 31):**
The plants growing on the summit are ground-hugging or low growing subshrubs, many of them woody at base, herbs or geophytes found in the basalt scree and grassland and a number of endemic aquatics found in the standing water in eroded areas in summer. Any spillage of rubble outside the line of construction will destroy this vegetation. If construction is done in winter there will be no way of knowing what plants need rescue.

**Mitigation:**
This is a highly sensitive habitat and the headwaters of the Mkhomazana river. It is not an area which can handle anything more than a road running through it. Because it is mostly level, construction will be fairly simple, but under no circumstance should the area be used for any other purpose, particularly:

- No construction camp activities.
- Plants in the line of construction should be rescued and propagated in Lesotho. The curator of the Botanic Gardens at Khatse has a programme for community nurseries and should be asked to set up one Sani Top or nearby. These high altitude plants will not be easy to cultivate at lower altitudes.
- Plant rescue work must be planned well in advance of construction to ensure that the short summer months are utilised for growing.
- Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed.
6.7 Old Borrow Pits and Old Quarries on Sani Pass
The old borrow pits and quarries on the roadside have been revegated naturally over time, particularly above the South African border post, and are full of interesting species not easily viewed elsewhere in South Africa outside of the eastern mountain region and southern Drakensberg in particular. Loose gravels provide a perfect habitat for certain species which will not easily grow in more stable environments.

Potential impact (Map site 23):
Road widening could affect these old borrow pits and quarries which might be considered for turning and storage areas.

Mitigation:
- Loose soil and gravel on roadside banks should be retained with plants and not by using artificial materials.
- Rehabilitation must proceed as soon as the final surface of the road and surrounds has been completed and should follow the guidelines in Section 9.4 Vegetation Rehabilitation Plan.

6.8 Positive Impacts
Positive impacts associated with the upgraded road
- Reduced dust on roadside plants. Although dust is not a major negative factor due to the high rainfall, mist and slow vehicle speeds on the Pass, reduction of dust will be beneficial.
- Stormwater management, particularly on the upper reaches of the Sani Pass, would prevent extreme erosion and potential loss of vegetation due to land slippage. (Positive impacts on vegetation are shown in the mitigation scores in numbers 6.1-6.7)
- An IAP control plan would have benefits during and after construction.
- Viewing sites: carefully managed and constructed viewing sites (including environmentally friendly toilets) would control the potentially destructive effect of trampling and the use of the current viewing sites as toilets. At present the trampling effect is limited. With increased visitors on the Pass with an all-weather road, this could change.
6.8.1 Dust
Dust thrown up by vehicles travelling on a gravel road accumulates on the vegetation. In dry periods, this can have a negative effect on the plants. In these mountains, mist and rain during the rainy season will keep the dust under control. There could be a more marked dust build-up in winter. No data is available to quantify the negative effects of dust on the vegetation, but there would be entirely positive effects of a hardened surface with no dust at all.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Dust levels after construction will be reduced to zero.</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
</tr>
<tr>
<td>Duration</td>
<td>Permanent</td>
<td>2</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the local area</td>
<td>2</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration+Extent+Magnitude x Probability</td>
<td>50</td>
</tr>
<tr>
<td>RANKING</td>
<td>POSITIVE</td>
<td>MODERATE</td>
</tr>
</tbody>
</table>

6.8.2 Invasive Alien Vegetation
Invasive Alien Plants (IAPs) are found to increase in the disturbed ground of a construction area. If an IAP control plan is put into place as soon as construction starts, it would have the effect of controlling any future invasions due to construction as well as removing current infestations. This would be a very positive impact. The mitigation scores below reflect the potential affects if such a comprehensive IAP programme was implemented.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>If an IAP program is instituted, the current IAP infestation will be removed (in addition to dealing with any new, construction-related infestation).</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term: 5-15 years</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Limited to the local area</td>
<td>2</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way</td>
<td>6</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration+Extent+Magnitude x Probability</td>
<td>55</td>
</tr>
<tr>
<td>RANKING</td>
<td>POSITIVE</td>
<td>MODERATE</td>
</tr>
</tbody>
</table>

6.8.4 Provision of managed viewing sites including toilet facilities
Installation of properly designed and managed viewing sites will reduce pressure on roadside vegetation.

<table>
<thead>
<tr>
<th>POTENTIAL IMPACT</th>
<th>Installation of properly designed and managed viewing sites will reduce pressure on roadside vegetation.</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Definite</td>
<td>5</td>
</tr>
<tr>
<td>Duration</td>
<td>Long term &gt;15 years</td>
<td>4</td>
</tr>
<tr>
<td>Extent</td>
<td>Local</td>
<td>2</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate, will result in processes continuing but in a modified way, High (processes are altered to the extent that they temporarily cease)</td>
<td>6</td>
</tr>
<tr>
<td>SCORE</td>
<td>Significance points = Duration+Extent+Magnitude x Probability</td>
<td>60</td>
</tr>
<tr>
<td>RANKING</td>
<td>NEGATIVE</td>
<td>MODERATE</td>
</tr>
</tbody>
</table>
The Drakensberg and Lesotho is a famous destination for plants. Botanical tourism attracts people from around the world who are looking for alpine (high altitude) plants as well as tourists with a general interest in wild flowers and trees. Botanical tourism on the Sani Pass is particularly accessible because people do not have to be mountaineers to view many of the rare and endemic species from the roadsides. There will be a number of potentially negative impacts on this form of tourism:

- The higher speeds of traffic on an all weather surface will make botanical tourism (walking along the roadside) potentially more dangerous.
- Botanical tourism will be severely affected where roadside vegetation has been destroyed and where steep slopes and cliffs have been stabilised. In mitigation, it is recommended that a hiking trail be designed in association with Ezemvelo KZN Wildlife and tour operators, using the old mule track from the current border post, which would allow for safe hiking and walking up the Pass once the upgraded road is completed.
- In the short term, botanical tours might have to be cancelled due to the construction on the Pass. At present, the Sani Pass itself is the major attraction to botanical tourists and construction will prevent them from walking the route and from getting out of their vehicles at any point of the Pass to view plants.

8. DISCUSSION AND CONCLUSIONS

The upgrade to the road will have a significant potentially negative impact on the vegetation in and around the road reserve – on the actual plants and on the visual effect provided by the plants. These potential impacts can be mitigated by appropriate action:

- A number of rare and endemic species of plants will potentially be negatively impacted by destruction of habitat on the road verges. Construction methods can be adapted to minimise the impact on the vegetation. A well resourced vegetation rehabilitation programme needs to be run concurrently with construction. It is particularly important to appoint an experienced rehabilitation consultancy. Few of the rare plants on the Sani Pass have been cultivated before in South Africa so there is a risk attached to the rehabilitation process.
- The visual conformity of the vegetation will be adversely affected unless a very careful rehabilitation plan is put into practise. This is also important for biodiversity issues and ecological processes.
- Invasive Alien Plant species can be expected to colonise and expand populations on the disturbed ground in the construction footprint. Monitoring and removal of Invasive Alien Plants (IAPs) during the construction period, as well as dealing with current (and future) infestations, would control future potential impacts and improve the current conditions.
- The potential impacts on the vegetation of Sani Pass could adversely affect botanical tourism, as well as the general tourist and pedestrians due to a number of factors listed above. In addition, the higher speeds of traffic on an all weather surface will make walking along the roadside dangerous. It is recommended that a hiking trail to be designed (in association with Ezemvelo KZN Wildlife and tour operators), using the old mule track. It would allow for safe hiking and walking up the Pass once the upgraded road is completed.
- Mitigating factors would also include the operational phase Environmental Management Plan (EMP), with input from the engineers, specialist consultants and Ezemvelo KZN Wildlife (the management authority of the World Heritage Site), who should carefully consider how the new road up the Pass will be used and how best to ensure safety of pedestrians and hikers, all types of vehicles and the natural environment. These measures would include speed limits as well as designated parking areas, picnic and viewing sites.
- The stabilisation of the zigzag section will almost completely destroy the rare vegetation types in that area. However, if no measures are taken to manage stormwater runoff and land slippages, vegetation will anyway be destroyed over time.
- Positive impacts of construction of an upgraded road up Sani Pass on vegetation would be the management of stormwater drainage to reduce erosion and the risk of land slippages. There will also be less dust due to the all-weather road surface.
9. REFERENCES


Diversity Network Report No. 14


ACRONYMS

DAC Drakensberg Alpine Centre

DOT Department of Transport

ECO Environmental Control Officer

EIA Environmental Impact Assessment

EMP Environmental Management Plan

EMR Eastern Mountain Region


IAPs Invasive Alien Plants
10 ENVIRONMENTAL MANAGEMENT PLAN, SANI PASS ROAD UPGRADE

10.1 Management of Road Reserve, Construction Phase

A full time Environmental Control Officer (ECO) should be appointed to be available on a daily basis to supervise construction phase and ensure compliance with the EMP and to prepare regular site audit reports. The duties of the ECO should include the following:

- Traverse the route with the resident engineer to check the surveyed construction path to draw attention to the sensitive areas
- Plant rescue within the construction path should start no later than 2-4 weeks before construction begins. (see Section 9.5 Vegetation Rehabilitation Plan)
- Liaise with Ezemvelo KZN Wildlife to ensure that all wild flower rescue teams have permits to transport the plant material to nurseries or holding areas, and to supervise all collecting operations.
- Before machinery moves on site, check that the supervising engineer understands the extreme sensitivity of specially protected areas of conservation significance along the route.
- Provide training to drivers of heavy machinery, and all staff, regarding the fragile and very valuable vegetation before any work starts
- Penalties must be imposed for any infringements, as listed below, to the drivers and staff of construction company and its subcontractors (to be included in tender documents):
  i) Driving anywhere outside the demarcated construction area (whether to reverse or turn the machine or for any other reason whatsoever)
  ii) Damaging any tree outside of the construction area or any tree marked for protection within the construction footprint.
  iii) Damaging any rock outside of the construction area or any rock marked for protection within the construction footprint.
- A temporary fence shall be erected along the edge of the construction area along the road. This fence must allow small wildlife to move through it. Gaps should be left for larger animals to move through it.
- All rubble after blasting to be removed, where possible, without causing undue further damage to the immediate surroundings outside of the construction zone.
- Litter from construction crews to be collected daily.
- There must be no plant collecting or collecting of firewood or kindling (any staff member found in possession of plant material to be ordered off site permanently).
- Any new slope is to be stabilised or shaped to allow for immediate rehabilitation and not to be smoothed off perfectly. The slopes should rather be left with an uneven finish to reduce stormwater runoff and to hold seed material.
- Rehabilitation should proceed as soon as each section of road is completed. Full rehabilitation work will only be possible from August to May each year. Interim measures to reduce runoff are needed during the winter months ie local mulch from the Pass. Geofabric should only be used as a last resort. (see 9.5 Vegetation Rehabilitation Plan)
- All trees should be considered sensitive in this mountain region. Permission must be granted by the ECO before any tree is removed in the line of construction. In addition, the following must be noted: the first 200mm of a tree main stem (trunk) must not be covered with soil or rock (this would be the equivalent of ring-barking the tree). As soon as earth moving is completed in each section, the ECO must ensure that any trees in the construction area have been cleared at base to the original soil level.
10.2 Management of the road reserve: Operational Phase

- A contract needs to be in place to check on the rehabilitated roadsides. Any die-offs or slippage of plant material and mulch should be repaired or replanted as soon as possible. This should be included in the vegetation rehabilitation contract.
- Erosion of rehabilitated surfaces will need to be repaired as soon as possible until the vegetation has grown sufficiently to secure exposed soil.
- Speed restrictions must be enforced for safety of vehicles and pedestrians. Tourists should be able to view the vegetation along the roadsides or, at least, at designated viewing or picnic spots.
- Picnic and parking sites should be planned well in advance, taking into consideration the potential for greatly increased tourist numbers once the road is improved.
- A hiking path should be considered as a safer option to walking up the road.
- A programme to control IAPs should be in place in perpetuity.
- A management plan to incorporate the above matters, as well as litter collection, toilets at picnic spots etc should be the responsibility of Ezemvelo KZN Wildlife.

10.3 Management of Invasive Alien Plants

- An IAP management plan must be drawn up by the Dept of Agriculture/WfW, consulting engineers, Ezemvelo KZN Wildlife and the botanical consultant.
- The Department of Agriculture and/or Working for Water should appoint a team to work on Sani Pass before, during and after construction until the Pass through this World Heritage Site is reasonably clear of IAPs. It is recommended that this be a high profile programme to clear the World Heritage site of IAPs whilst also keeping the construction route clear of weeds. It will require liaison with Ezemvelo KZN Wildlife, private property owners and DOT. A successfully implemented programme should be considered a mitigating factor.
- IAP occurrence needs to be mapped and photographed prior to construction. (Part of this process has been completed.)
- All IAP material removed during construction should be dumped in a landfill site or burnt. Wood from wattle, gum and other trees should be made available under a controlled harvesting scheme to local communities, including those in Lesotho.
- Once construction of each section is completed, the new and open roadsides should be weeded by hand. If spraying is to take place, it should be done using the ‘cut and spray’ system where each team member uses a small hand operated (not pressurised) spray.
- IAPs should be the first priority, but emerging weeds should also be included where necessary. This particularly applies to the higher altitude sections of the Pass.
- This programme must be maintained until construction is completed and for at least two to three summers after construction. During the coldest winter months, control work could concentrate on the large scale infestations at the foot of the Pass. Once the roadsides have been rehabilitated invasion of IAPs will be limited and can be dealt with as part of routine park maintenance.

10.4 Selection of Turning and Storage Areas

Consultations are under way between the consulting engineers and Ezemvelo KZN Wildlife to select and plan these very important areas. If carefully chosen in areas of least importance biologically, they can be turned into viewing sites when the road is completed.

The final siting of turning and storage areas should also be approved by the EIA consultants.
10.5 Vegetation Rehabilitation Plan, including Plant Rescue

- A budget adequate to meet the requirements of rehabilitating roadsides in a World Heritage Site must be allocated. A suitably qualified contractor must be appointed to handle this sensitive project.
- Planning with the consulting engineers, rehabilitation contractor and botanical consultant should start as soon as possible. A committee of propagation experts (2-3 people) would be helpful (including the curator of the Lesotho Botanic Garden at Khatse for high altitude species).
- Liaison with the consultants of Stage 1 of the road construction would be useful, to see how and what rehabilitation has been undertaken to date and what success or failure has been achieved.
- Only the roadsides in the path of actual construction should be cleared – not the whole pass at once. Damage to vegetation will be immediate once construction begins. It can be mitigated to a certain extent if all earthmoving, blasting, removal of material after blasting and stockpiling is carefully contained within the construction footprint. Turning areas and stockpile areas must be carefully selected and managed.
- Rehabilitation should commence as soon as each section of the road has been completed. Full rehabilitation will only be possible from August to May each year. Interim measures to reduce run-off are needed during the winter months ie mulch.
- It is recommended that Ezemvelo KZN Wildlife creates a database of suitably qualified plant growers who will be invited to remove any excess plants in the line of construction in consultation with the rehabilitation contractor. A percentage of the plants successfully cultivated by them will need to be returned to the rehabilitation contractor in due course when required. Few of the plants on Sani Pass are currently being cultivated in South Africa.

10.5.1 Rehabilitation methods on a mountain pass

The vegetation rehabilitation on the Outeniqua Pass in the Western Cape was planned and carried out by expert vegetation consultants (led by consultant Liesl Stokes), the road engineers and a Pretoria-based rehabilitation company, Hydromulch. The following rehabilitation recommendations were drawn up after discussions with the lead vegetation consultant on the Outeniqua Pass (OP):

- Set up experiments to test the most effective system to rehabilitate different types of roadside e.g. flat-soil, steep-soil, steep-rock, stream banks etc. The most effective system found on the OP was a fynbos mulch (followed by two different types of geofabric).
- Use the roadside rehabilitation experiments to test for the best time of year to do the rehabilitation.
- Test before using Biddum. It was found to be a problem behind gabions on the OP – the soil blocked the fabric, causing problems with drainage.
- Every effort must be made to provide fill rather than a ‘cut’ finish on the roadsides. This needs discussion at design stage with the engineers.
- It was found that all paints (for use on blasted rock faces) tested at that time (2000) faded quite quickly. The most successful method to mask the newly cut rock faces was to use bitumen sprayed onto the Table mountain sandstone. This surface was plant friendly too.

10.5.2 Preparations for rehabilitation

- Remove the topsoil with machine-cut sods. Stockpile on tarpaulin to catch any seed material etc. Keep grass- and mixed-plant-sods separately
- Collect seed, by hand, under supervision of the Ezemvelo KZN Wildlife.
• Rescue all plant material which is suitable for stockpiling under nursery conditions. Stockpile all brushwood and natural mulch, keeping separate material from each section of the road or at least, each vegetation type.
• Permission is needed to collect mulch from adjacent hillsides.
• Experiments showed that using chipped bark was not as effective as the natural mulch (with uneven shapes and sizes). This natural mulch holds seed material and was effective even after years of stockpiling. The quicker it is put to use, the more successful the rehabilitation.
• If additional soil is required, particularly at the higher altitudes, check to see if soil quality and composition is important for rehabilitation. This was not the case on the Outeniqua Pass but might be so on Sani Pass where plants are adapted to basalt-derived soils at the highest altitudes.

10.5.3 Rehabilitation

• Pack roadsides with topsoil sods where possible
• Hydroseed with local seed
• Lay mulch
• Where there is saved plant material e.g. Watsonias, they can be successfully planted or pegged onto steep banks.
• Special attention must be given to re-vegetating viewing areas.
• It is important NOT to smooth off surfaces. The success of rehabilitation is all about providing a variety of microclimates. Every small stone offers a warm and a cool side, providing suitable environment for e.g. a vygie on the one side and a Lobelia on the other. It is particularly important to leave as many crevices and shelves on cliff faces as possible. This will allow for accumulation of soil and plant litter, providing a suitable habitat for plants.
• The rehabilitation contractor should aim to achieve 80% coverage over a 3-year period (OP)

NOTE: Some species benefit from loose soil and rocks on the unstabilised roadsides. Others are restricted to rockfalls, floodplain areas along streams and rivers, cliffs etc. When planning the final shape of roadsides, care should be taken to allow some unstable areas (where it is safe to do so), to ensure that the plant species adapted to these conditions can be re-introduced successfully.

10.5.4 Rehabilitation around key viewing areas
These areas need to be confirmed with the consulting engineers. The surrounding hillsides and vegetation should be preserved, as a first choice, and rehabilitated carefully, as a second choice. These sites will be heavily utilised by tourists.

10.5.5 Rare and endangered species
Where these species are growing in the road reserve, every effort should be made to avoid disturbing them at all during construction. Discussion is needed with the consulting engineers regarding road design to either protect the vegetation in that area or to plan the rehabilitation with particular care.
PROPOINET
The KwaZulu-Natal Department of Transport in association with the Department of Transport (DoT) are the project proponent

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Consultant Elsa Pooley Indigenous Landscaping (EPIL) – Elsa Pooley Botanical Tours
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Elsa Pooley has worked with plants in KwaZulu-Natal for over 40 years. Her experience includes collection of herbarium specimens, vegetation mapping, studies on invasive alien species, utilisation of plants, checklists, setting up indigenous plant nurseries, indigenous gardens including a number of large public facilities (eg landscape design of Maliba Lodge in Tsehlenyane National Park, Lesotho). She operates as ECO on development projects and her company (EPIL) is engaged in a number of coastal dune rehabilitation projects and indigenous landscaping. Her botanical tour company operates all over KZN and specialises in tours of the Drakensberg and Lesotho. She has written field guides to Trees of KZN and the eastern region, Wild Flowers of KZN and Eastern region, Mountain Flowers of the Drakensberg and Lesotho, Forest Plants and other identification guides. She is a botanical artist and teaches a botanical art course in the Drakensberg twice a year.

AWARDS
1996 Conservationist of the Year Wildlife & Environment Society of SA (KZN)
1999 Certificate of Merit for outstanding contribution to botany South African Association of Botanists
2004 Marloth Medal Botanical Society of SA
2008 Doctor of Science (honoris causa) University of KwaZulu-Natal
Map 2: Significant Landscape/Vegetation Features and Rare and Endemic Plants

LEGEN

- Significant Landscape Features
- Rare & Endemic Plants
- Degraded Area
- Impacted Zone
Map 3: Significant Landscape/Vegetation Features and Rare and Endemic Plants
LEGEND

4 Viewing Point, Protea Veld
5 Big boulders/Christmas bells corner

Map 4: Significant Landscape/Vegetation Features and Rare and Endemic Plants
Map 5: Significant Landscape/Vegetation Features and Rare and Endemic Plants
LEGEND

6 Stream crossing below Kniphofia marsh
7 Red Hot Poker marsh
8 Viewing site

Map: Significant Landscape/Vegetation Features and Rare and Endemic Plants
Map 8: Significant Landscape/Vegetation Features and Rare and Endemic Plants

LEGEND
- Significant Landscape Features
- Rare & Endemic Plants
- Degraded Area
- Impacted Zone

10 Border post
11 River crossing
Map 10: Significant Landscape/Vegetation Features and Rare and Endemic Plants

13 Twinstreams
14 Agapanthus hill
15 Protea subvista
16 Eucomis bank
17 Viewing site
18 Leucosidea sericea, Berkhya purpurea, Stream
19 Erica corner viewing site
20 Stream crossing
21 Wild flower lunch site

LEGEND
- Purple: Significant Landscape Features
- Green: Rare & Endemic Plants
- Red: Degraded area
- Orange: Impacted Zone
Map 12: Significant Landscape/Vegetation Features and Rare and Endemic Plants

LEGEND
- Significant Landscape Features
- Rare & Endemic Plants
- Degraded Area
- Impacted Zone

31 Summit Flats
List of Botanical Species found along the Sani Pass Road

Rare, endangered and endemic species

a) Vulnerable:
Disa scullyi
Helichrysum haygarthii
Macowania hamata

b) Lower risk, least concern
Disa basutorum
Disa cephalotes subsp. frigida
Disa oreophila subsp. erecta
Disa pulchra
Disa sankeyi
Disa stachyoides
Disa thodei
Disperis stenoplectron
Disperis tysonii
Disperis wealei
Macowania corymbosa
Neobolusia tysonii
Othonna burttii
Satyrium microrrhynchum
Schizochilus zeyheri
Wahlenbergia cuspidata

c) Lower risk – near threatened
Rhodohypoxis incompta
Rhodohypoxis thodiana

EMR Endemic Plants found on Sani Pass
Albuca sp. c.f. humilis
Alchemilla colura
Alectra basutica
Alepidea thodei
Aster erucifolius
Athrixia angustissima
fontana
Berkheya cirsifolia
multijuga
Cephalaria galpiniana subsp.simplicior
Cotula paludosa
radicalis
socialis
Cynoglossum austro-africanum
Delosperma lavisiae
Diascia barberae
Dierama dracomontanum
dracomontana
Dracomonticola virginea
Erica algida
straussiana
schijffii
Eumorphia prostrata
Euryops acraeus
decumbens
evansii
tysonii
uliginosa
Geranium drakensbergense
pulchrum
Gladiolus flanaganii
Glumicalyx flanaganii
goseloides
lesuticus
montanus
nutans
Harveya pulchra
Hebenstreitia cooperi
Helichrysum drakensbergense
flanaganii
lineatum
marginatum
milfordiae
pagophilum
praecurrens
Helichrysum retortoides
sessiloides
tenuifolium
trilinatum
Heliophila formosa
Hesperantha crocopsis
Hyobanche rubra
Inulanthera thodei
Jamesbrittenia brevitilora
lesutica
pristisepala
Kniphofia ritualis
Limosella vesiculosa
Lithospermum afromontanum
Lobelia galpinii
Lotononis galpinii
pulchella
sericophylla
Macowania corymbosa
hamata
pulvinaris
soronis
Manulea platystigma
Merxmuellera aureocephala
drakensbergensis
Moraea albicuspa
Nemesia caerulea
Ornithogalum sephtonii
Psammotropha obtusa
Relhania dieterlenii
Rhodohypoxis rubella
Romulea thodei
Scabiosa drakensbergensis
Schizoglossum bidens
Sebaea thomasii
Invasive Alien Plants

a) Some of the most problematic alien invasive species recorded (mostly below 1800m)
   - Acacia mearnsii
   - Cotoneaster spp
   - Pyracantha spp.
   - Rubus cuneifolius

b) Other weeds occurring on the roadsides
   - Avena fatua
   - Bromus unioloides
   - Juncus tenuis
   - Lepidium bonariense
   - Oenothera rosea
   - Plantago lanceolata
   - Polygonum arenastrum
   - Fallopia convolvulus [= Polygonum convolvulus]
   - Taraxacum spp.
   - Trifolium repens
   - Vulpia myuros