BOTANICAL ASSESSMENT FOR THE PROPOSED UPGRADE OF THE ACCESS ROAD AND BRIDGE OVER THE OLIFANTS RIVER ON THE FARM VISGAT 207, AND DEVELOPMENT OF THREE AGRICULTURAL AREAS, CERES, WITZENBERG MUNICIPALITY, WESTERN CAPE PROVINCE

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Report prepared for EnviroAfrica: Client Doornkraal Agri

National Legislation and Regulations governing this report

This is a 'specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014, as amended.

Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by EnviroAfrica CC to provide specialist botanical consulting services for the proposed upgrade of the access road and bridge over the Olifants River as well as three areas for agricultural development on the farm Visgat 207, Ceres, Witzenberg Municipality, Western Cape Province.

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Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 40 years' experience in the field of Vegetation Science.
- Founded Bergwind Botanical Surveys & Tours CC in 2006
- Has conducted over 500 specialist botanical / ecological studies.
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request)

Curriculum Vitae – Appendix 2.

Independence

The views expressed in the document are the objective, independent views of Dr McDonald and the study was carried out under the aegis of, Bergwind Botanical Surveys and Tours CC. Neither Dr McDonald nor Bergwind Botanical Surveys and Tours CC have any business, personal, commercial, or other interest in the proposed development apart from fair remuneration for the work performed.

Conditions relating to this report

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Bergwind Botanical Surveys & Tours CC, it's staff and appointed associates, reserve the right to modify the report in any way deemed fit should new, relevant or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field, or pertaining to this investigation.

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Declaration of independence:

I David Jury McDonald, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity;
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the specialist:

Company: Bergwind Botanical Surveys & Tours CC Date: 28 May 2022

CONTENTS

1. Introduction

Doornkraal Agri (the Client) proposes to realign the access road to their Farm Visgat 207 at three places, and to rebuild the bridge over the Olifants River to accommodate the movement of heavy vehicles with long trailers. In addition, three areas on the property have been earmarked for agricultural development (fruit orchards).

Bergwind Botanical Surveys & Tours CC was appointed by EnviroAfrica (CC the environmental practitioners [EAPS]) to carry out a botanical impact assessment for the proposed changes given above.

The study is conducted in terms of the National Environmental Management Act (NEMA) (No.7 of 1998) as amended and the 2014 Environmental Regulations. The protocols pertaining to terrestrial ecological specialist assessments are applied (GN 320 of 2020).

2. Project Description

Farm Visgat 207 lies at the end of the road in the Olifants River Valley, at the headwaters of the river. Fruit orchards have been developed over the past twenty or so years and there is scope for limited future agricultural expansion due to the type of terrain. However, three areas have been identified as possible areas for development. The upgrade of the access road has also been identified as a necessity to allow for heavy trucks to access the farm packhouse. These long trucks have difficulty negotiating the road as it is due to sharp bends in three places. The low-level concrete bridge over the Olifants River is also no longer adequate and a new bridge is needed that is proposed to be built immediately upstream (south) of the existing bridge.

3. Terms of Reference

The Terms of Reference for this specialist investigation were to undertake a site visit to the study area and compile a specialist report that addresses the potential *Terrestrial Botanical Impacts* of the bridge and road re-alignment as well as for the development of three agricultural areas.

The study should highlight (1) habitat sensitivity; (2) threatened ecosystems (including critical biodiversity areas); (3) plant species of conservation concern (SCC) also known as Red List plants; and (4) direct and cumulative impacts of the proposed facilities on the receiving environment.

4. Study Area

4.1 Locality

The proposed access road upgrade would be at three locations that are numbered 1—3 from the bridge southwards. The locations at central points are: (1) S 33° 04’ 57.03” E 19° 13’ 09.76” (2) S 33° 05’ 12.05” E 19° 13’ 13.31” and (3) S 33° 05’ 31.84” E 19° 13’ 12.14”. Location (3) lies outside the southern boundary of Farm Visgat 207. The bridge location is S 33° 04’ 36.33” E 19° 13’ 01.11”.

Centroid locations of the three land parcels proposed for agricultural development are: Area 1- S 33° 04’ 46.48” E 19° 13’ 08.71”; Area 2 – S 33° 04’ 47 39” E 19° 13’ 04.89”; Area 3 – S 33° 04’ 56.55” E 19° 13’ 06.88”.

The average altitude of the Visgat study area is 650 m above mean sea level.

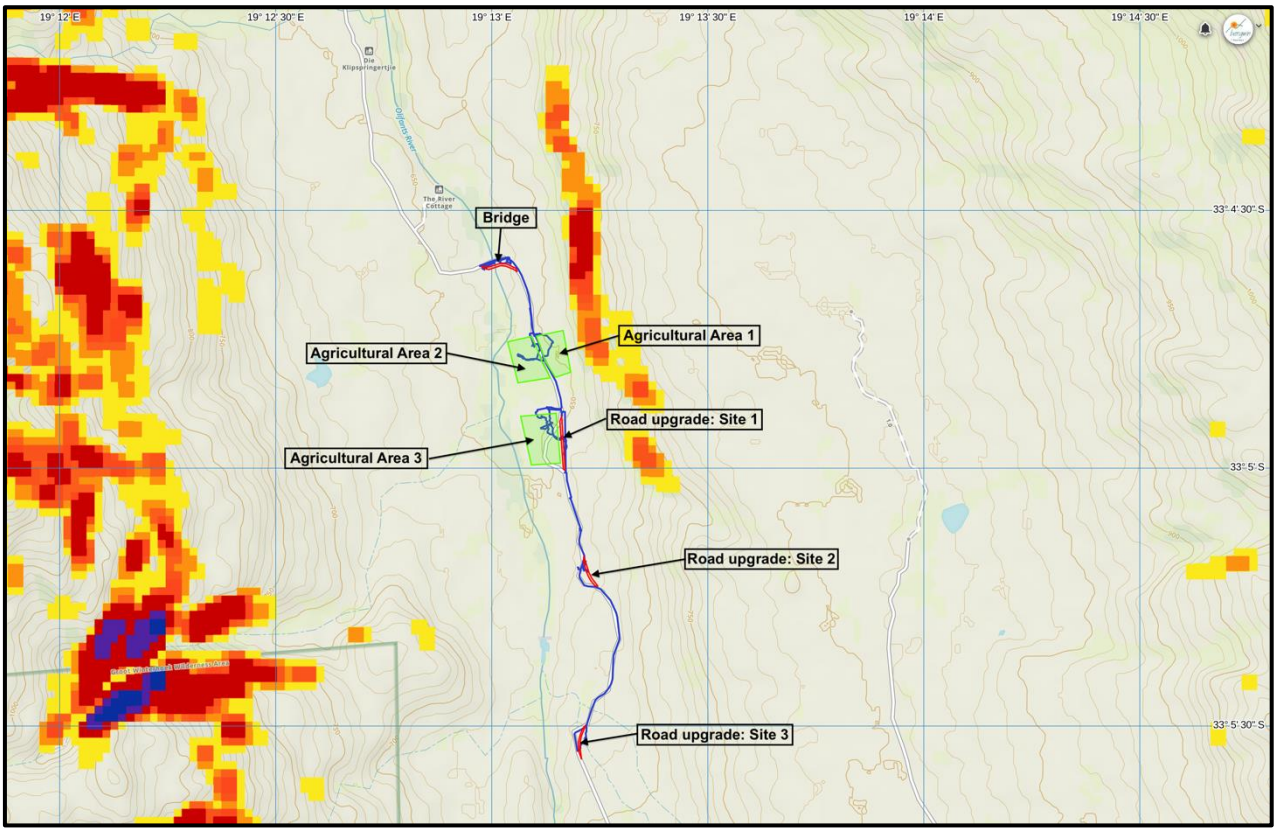


Figure 1. Topographic Map of the Visgat study area that is confined to the lower slopes in the Olifants River Valley.

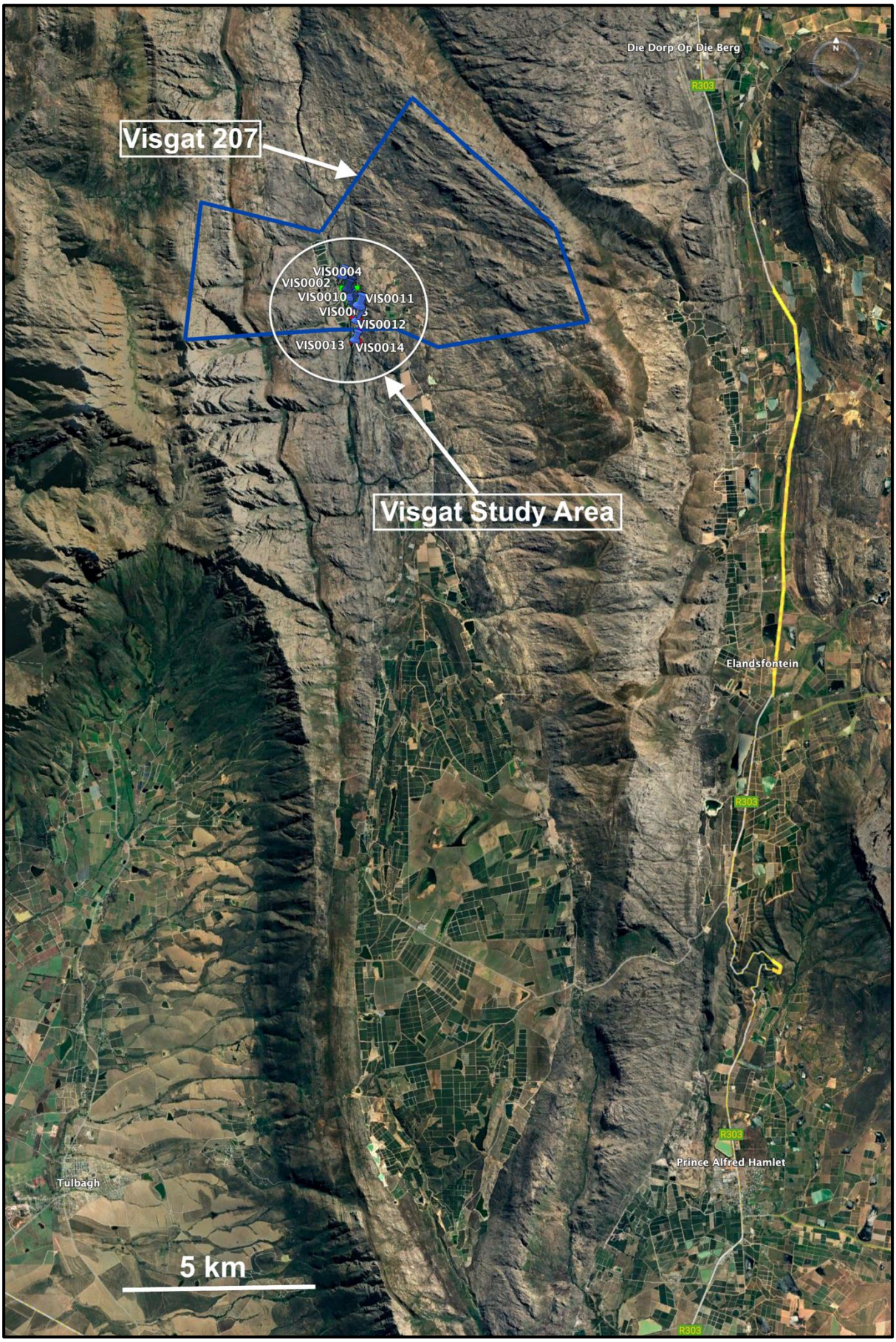


Figure 2. Satellite image (Google Earth Pro ™) of the farm Visgat 207, outlined in blue with the study area located in the Olifants River Valley at an approximate central location of the property.

4.2 Geology, topography, and soils

From the bridge over the Olifants River, the study area lies on the east side of the river. The exiting road undulates over the landscape from north to south as it crosses seasonal streams that drain to the Olifants River. As can be seen in Figure 1, the terrain through which the road passes is not steep. Likewise, the proposed areas for agricultural development lie on flat to slightly sloping areas on either side of the exiting road.

The underlying rock is quartzitic sandstone of the Skurweberg Formation, Nardouw Sub-group, Table Mountain Group. These sediments were laid down during the Ordovician Period, Palaeozoic Era and have given rise to yellow but leached, acidic lithosolic soils (Figure 3). In the bed of the Olifants River, at the bridge crossing, the sandstone bedrock has been polished by the action of water over the surface (Figure 4). Alluvial sand also accumulates on the banks of the river (Figure 5).

Figure 3. The yellow, rocky soil on the slopes where the road upgrade and agricultural expansion will take place is derived from the Skurweberg Formation sandstone.

Figure 4. The sandstone bedrock polished by water and sand action over a very long time. This location is just below the existing bridge.

Figure 5. Alluvial sand on the bank of the Olifants River at the point where the new bridge would cross the river.

4.3 Climate

The Visgat study area is in the winter rainfall region with rainfall occurring mainly from May to August as shown by the climate diagram for Winterhoek Sandstone Fynbos (Figure 6) (Rebelo *et al*., 2006). The climate regime of the Mediterranean-type with cool to cold, wet winters and hot dry summers. Frost occurs frequently in winter when there are also sporadic snowfalls. In summer, the southeast winds bring moist, misty conditions on the higher altitude areas of the Groot Winterhoek and Witzenberg mountain range, but this is not the case at the lower altitude location of the Visgat study area.

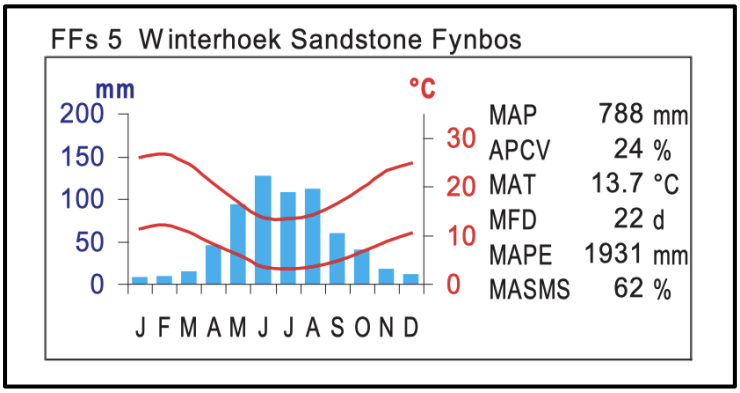


Figure 6. Climate diagram for Winterhoek Sandstone Fynbos, according to Rebelo *et al.*, 2006 (in Mucina & Rutherford, 2006) showing MAP – Mean Annual Precipitation; ACPV = Annual Precipitation Coefficient of Variance; MAT = Mean Annual Temperature; MFD = Mean Frost Days; MAPE = Mean Annual Potential Evaporation; MASMA = Mean Annual Soil Moisture Stress.

5. Methods

5.1 Field Sampling

The fieldwork for the assessment of the proposed bridge and road upgrade and the proposed new orchard areas was carried out 7 December 2021. The Visgat study area was surveyed from the existing bridge over the Olifants River where the new bridge would be constructed, southwards along the existing access road. The three proposed agricultural areas were simultaneously included in the survey.

Waypoints were recorded at eleven locations where photographs were taken. The co-ordinates of the 'sample waypoints' were obtained using a hand-held Garmin GPSmap 66i ® and the sample track was also recorded on the GPS as well as on the Gaia GPS app on an iPhone XR. By using the iPhone with preloaded maps on Google Earth ™, it was possible to ensure that sampling was carried out in the areas targeted for the proposed changes. The tracks and waypoints recorded are given in Figure 7.

The data collected during the survey was of high quality and recent i.e., the vegetation had not been subject to recent drought or any other negative abiotic influences such as a recent fire.

A second quick visit was undertaken on 28 April 2022 to determine whether there were any plant species in flower (autumn-flowering) that may have been missed during the initial site visit in early December 2021 (summer-flowering).

5.2 Desk-top analysis and reporting

The photographs obtained in the field as well as available literature and Google Earth Pro ™ were used for description and mapping of the vegetation presented in this report. The National Vegetation Map (Mucina *et al.* 2005; SANBI, 2018) (referred to as VEGMAP) (Figure 7) was used as the 'base-map' to determine the principal vegetation types that are described in Mucina & Rutherford (2006). The impact assessment method as in Appendix 1 was applied. The vegetation base map is dated 2019 and is the most recent version, however, it is more than adequate for the purposes of this project. The quality of the data used during the desktop analysis (see references below) proved to be of high quality, as was verified in the field.

Plant species were identified where possible using field guides and the online database iNaturalist (iNaturalist.org).

6. Limitations and Assumptions

The weather at the time of the survey was generally clear and warm to hot. There was thus no hindrance from rainy weather. No rain had fallen within the month prior to the field work and the vegetation was in fair to good condition. However, a fire had occurred in the study area approximately three years prior to the study so the vegetation was mostly in a young phase. Most geophytes and annuals were past growing and flowering although some were still seen in flower. The vegetation has a high graminoid component consisting mostly of sedges and restios with a smaller representation of grass species. Although species identification was limited to a certain degree by the season, the confidence placed in this botanical assessment is **high**.

In numerous cases, identification was possible to genus only, due to non-availability of flowering material

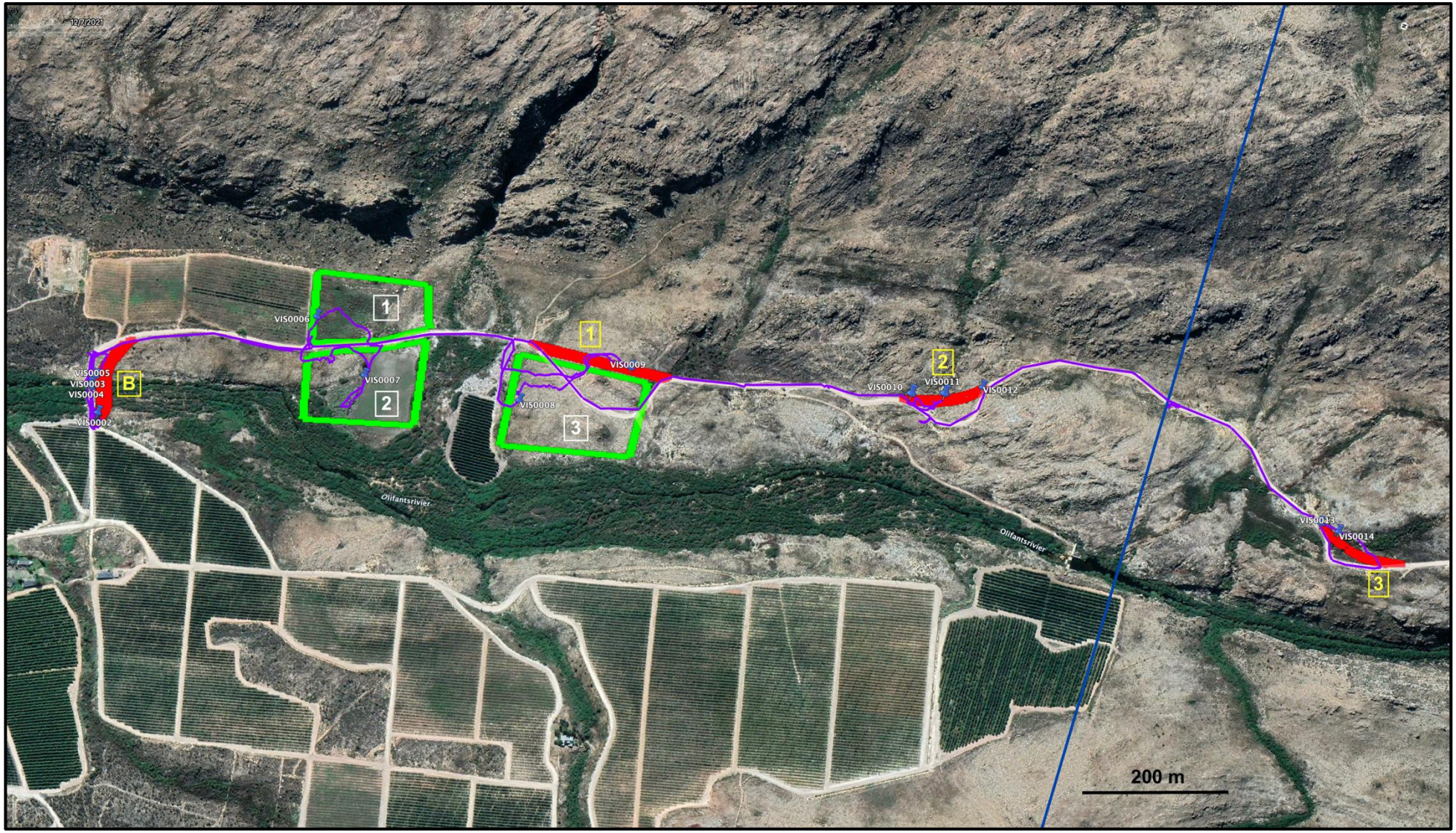


Figure 7. Satellite image (Google Earth Pro™) showing the bridge site (B), the agricultural areas 1—3 outlined in green, and the road upgrade areas 1—3 indicated in red with yellow numbering. The survey track is shown as a purple line with waypoints at blue pins (VIS#).

7. Disturbance regime

7.1 The proposed agricultural expansion areas – disturbance.

7.1.1 The agricultural expansion area, Area 1

Area 1 has been disturbed in the past by what appears to have been agricultural activities. It was burnt in the most recent fire and is now fallow (Figure 9). Further details are given below.

Figure 9. Agricultural Area 1 that was previously disturbed and is no colonized by ruderal species, many of which are exotic, weedy plant species.

7.1.2 The agricultural expansion area, Area 2

Area 2 is presently a soccer pitch for the farm labourers. The natural vegetation (fynbos) has been replaced by grass that is regularly mown (Figure 10). One part of the area is also disturbed by being transformed to grassveld (fallow) with heaps of cleared vegetation on the north side (Figure 11).

Figure 10. The soccer pitch with no natural fynbos vegetation.

Figure 11. The northern part of agricultural Area2 that has been transformed and is now grassveld, with heaps of cleared vegetation at the northern edge.

7.1.3 The agricultural expansion area, Area 3.

Parts of Area 3 are relatively undisturbed, but parts have been disturbed by the existing road that traverses the site and an area that has been used to dump agricultural waste (Figure 12). In addition, large sandstone boulders that were removed from cultivation area have been dumped in Area 3 as well (Figure 13). With the advent of the upgraded road, the section of the existing road that traverses Area 3 would be incorporated into the agricultural development of Area 3. The new section of road would run alongside the new orchard block.

Figure 12. Agricultural waste dumped in Area 3.

Figure 13. Boulders that have been removed from cultivated area have been dumped at this location in Area 3.

The only other disturbance of Area 3 is that it was burnt in a fire 2—3 years prior to the site visit and the fynbos vegetation is relatively young (Figure 14).

Figure 14. Undisturbed fynbos in Area 3 that was burnt in the last fire.

7.2 Disturbance at the proposed bridge and access road upgrade sites

7.2.1 Disturbance at the proposed new bridge site (B)

The existing bridge has been in place for a long time and the vegetation has grown up around it (Figure 15). However, on the south side, in the position of the proposed new bridge, there has been some recent disturbance caused by a large vehicle or tractor (Figure 16). This disturbance is localised and would be within the footprint of the proposed new bridge.

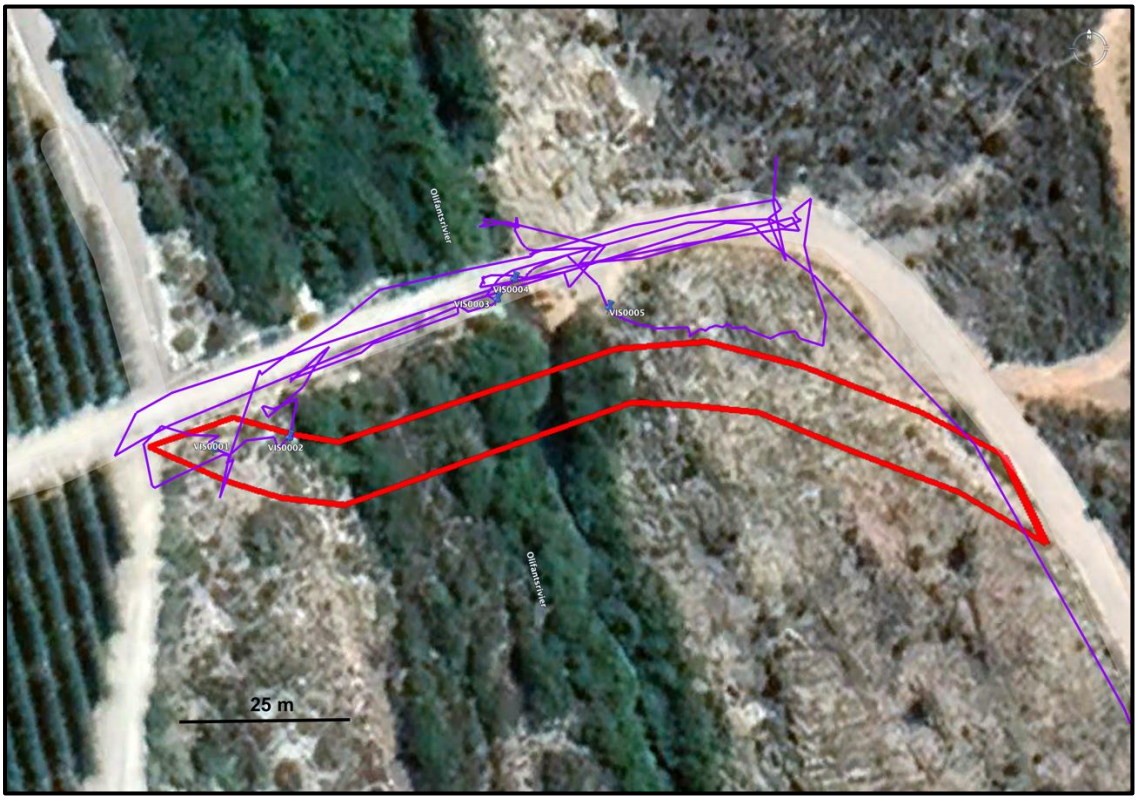


Figure 15. The proposed re-alignment of the access road and the position of the 'new bridge of the Olifants River.

Figure 16. The existing bridge over the Olifants River with disturbance of the riparian zone shown by the red arrows.

7.2.2 Disturbance at the Site 1 road upgrade location.

Site 1 will traverse an area of undisturbed fynbos to the east of the existing access road that was, however, burnt in the last fire 2—3 years prior to the site visit (Figures 17 & 18).

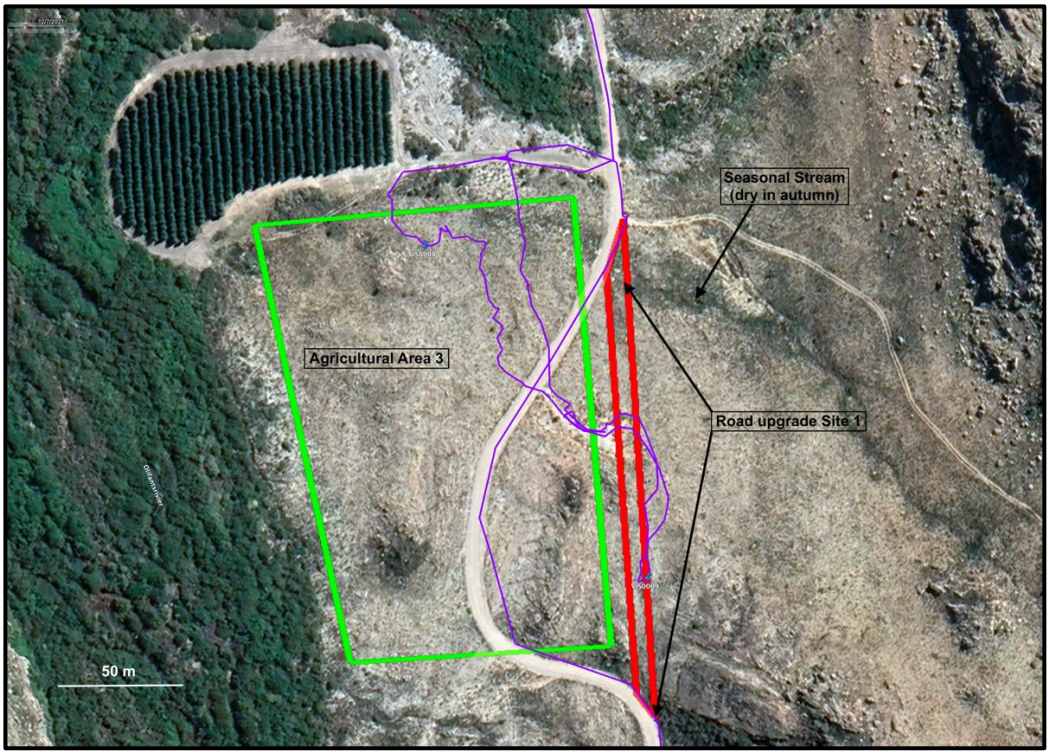


Figure 17. The proposed agricultural area, Area 3 (green boundary) with the existing access road through it, with the proposed Site 1 road upgrade (red). The northern extreme of the new road section would affect a seasonal stream.

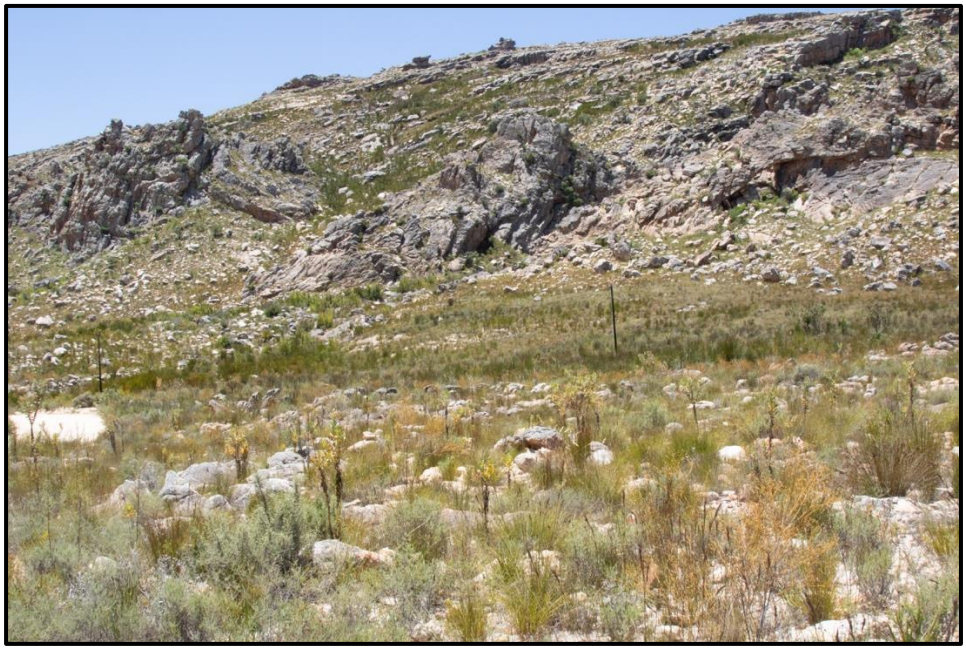


Figure 18. The undisturbed low fynbos vegetation (burnt in most recent fire) through which the road upgrade at Site 1 would be aligned.

7.2.3 Disturbance at the Site 2 road upgrade location

There is some historical disturbance (see Figure 50) along the Site 2 upgrade route (Figure 19) The young fynbos is recovering since the last fire (Figure 20).

Figure 19. The location of the road upgrade Site 2 that will traverse undisturbed fynbos.

Figure 20. The young fynbos (showing evidence of the most recent fire) through which the road upgrade Site 2 would be aligned.

7.2.4 Disturbance at the Site 3 road upgrade location

As for road upgrade Site 2, Site 3 does not have any historical disturbance. This area did not burn in the most recent fire which stopped at the edge of the wetland on the east side of the proposed upgrade route (Figures 21 & 22). There is some disturbance immediately north of the upgrade section where heaps of soil have been dumped (Figures 21 & 23).

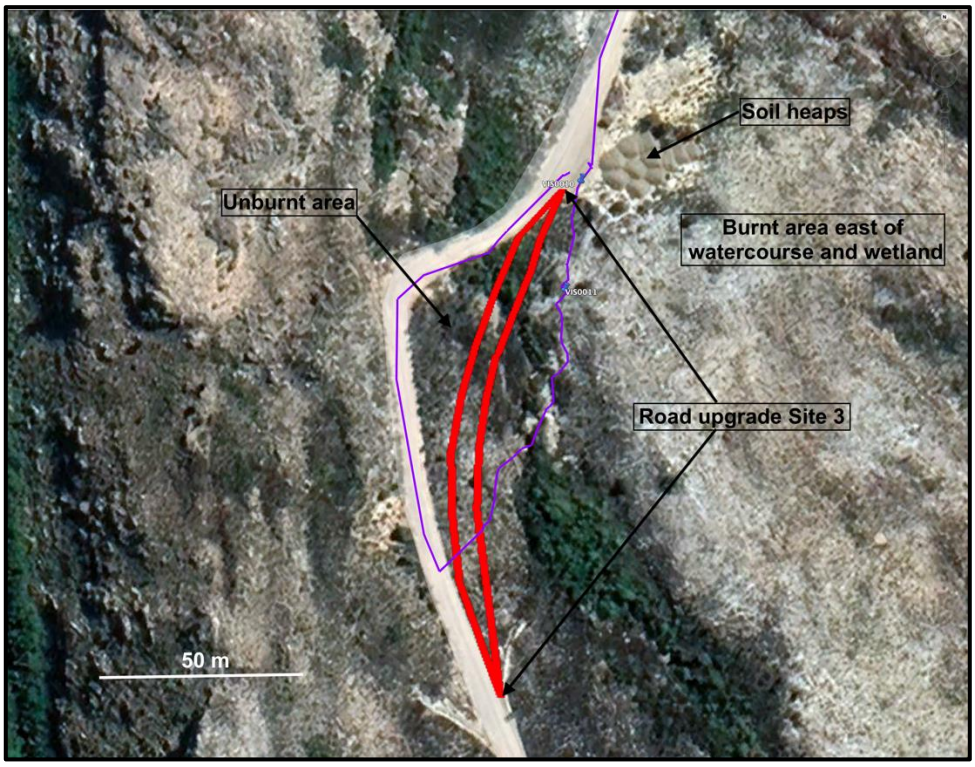


Figure 21. Road upgrade Site 3 will strong negatively affect a perennial stream and wetland. The wetland and stream vegetation did not burn in the most recent fire.

Figure 22. Mature, unburnt fynbos at the northern limit of the road upgrade Site 3.

Figure 23. Heaps of soil dumped just north of the northern extremity of Site 3.

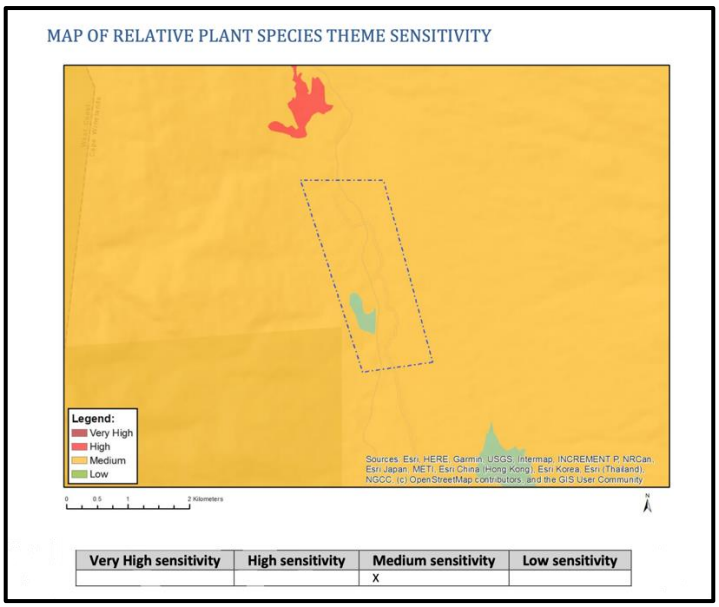
8. Botanical and Terrestrial Biodiversity Sensitivity

8.1 Sensitivity according to the National Environmental Screening Tool

The National Environmental Screening Tool was applied to an area encompassing the six areas that would be affected within the Visgat study area to determine the botanical sensitivity and the terrestrial biodiversity sensitivity of the site. The botanical sensitivity is **Medium** (Figure 24) whereas the terrestrial biodiversity is classified as **Very High sensitivity** (Figure 25).

8.2 Site Sensitivity Verification

The general conclusion from field observations is that there is agreement with the 'screening tool' in that the sensitivity of the vegetation is **medium**. However, no clear evidence could be found that supports the classification of the area as having a **very high** terrestrial biodiversity sensitivity. The area is not included in a Critical Biodiversity Area according to the maps consulted (Cape Nature, 2017). Given the extent of the vegetation type and low negative impact with respect to cumulative impacts (see below), the conclusion was reached that the terrestrial biodiversity sensitivity is **medium**.

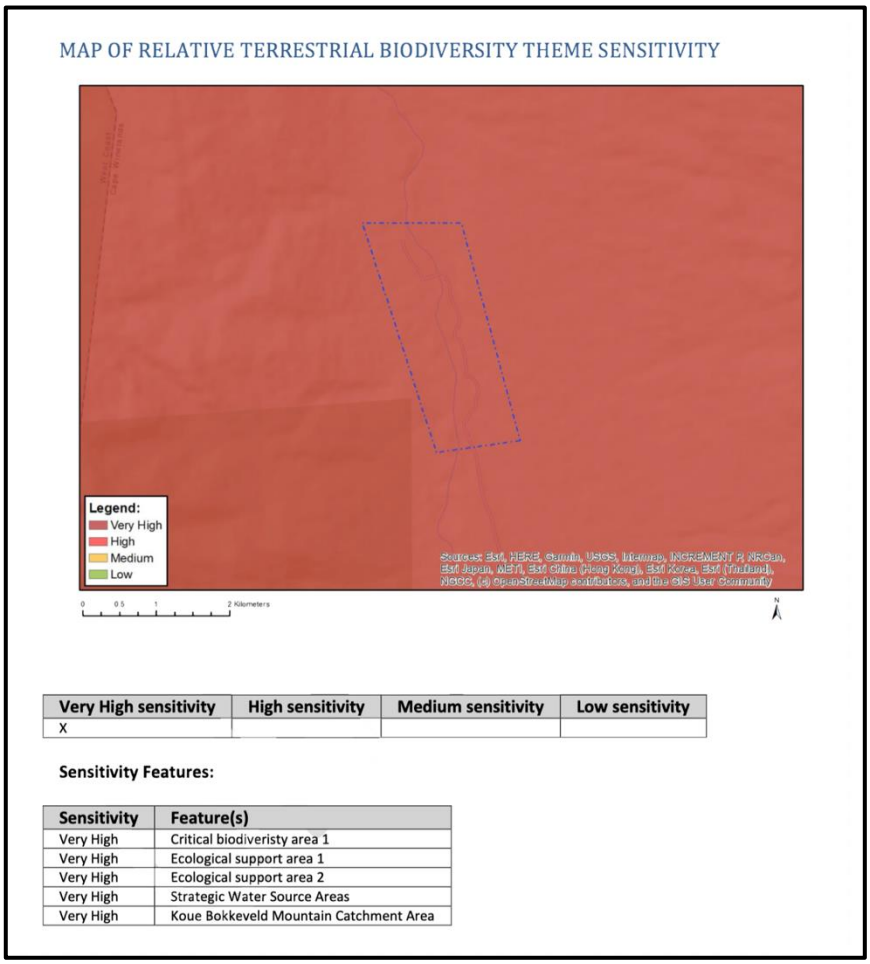


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Figure 24. The map of relative plant species them sensitivity indicating a medium status, with the associated sensitive plant species in the accompanying table.

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Lampranthus antonii
Medium	Indigofera fulcrata
Medium	Aspalathus suaveolens
Medium	Aspalathus ulicina subsp. ulicina
Medium	Sorocephalus imbricatus
Medium	Leucadendron chamelaea
Medium	Leucospermum catherinae
Medium	Protea pityphylla
Medium	Spatalla caudata
Medium	Serruria confragosa
Medium	Serruria reflexa
Medium	Prismatocarpus implicatus
Medium	Sensitive species 794
Medium	Pseudoselago quadrangularis
Medium	Nemesia acornis
Medium	Tritoniopsis lesliei
Medium	Thereianthus longicollis
Medium	Thereianthus racemosus
Medium	Sensitive species 477
Medium	Erica doliiformis
Medium	Erica oxysepala
Medium	Erica caprina
Medium	Pharnaceum microphyllum var. albens
Medium	Isolepis leucoloma
Medium	Ficinia cedarbergensis
Medium	Cannomois anfracta
Medium	Anthochortus insignis
Medium	Anthochortus singularis
Medium	Restio durus
Medium	Restio parthenocarpos
Medium	Sensitive species 848
Medium	Sensitive species 459
Medium	Sensitive species 706
Medium	Sensitive species 373
Medium	Evotella rubiginosa
Medium	Heliophila cedarbergensis
Medium	Lachnaea uniflora
Medium	Lachnaea pedicellata
Medium	Metalasia serrulata
Medium	Syncarpha marlothii
Medium	Sensitive species 1263
Medium	Ursinia coronopifolia
Medium	Senecio umbricola
Medium	Lamprocephalus montanus
Medium	Osmitopsis nana
Medium	Agathosma bathii
Medium	Agathosma insignis
Medium	Macrostylis barbigera
Medium	Phylica altigena
Medium	Phylica trachyphylla
Medium	Protea rupicola
Medium	Sensitive species 1209
Medium	Pachites bodkinii
Medium	Lachnaea capitata
Medium	Lachnaea grandiflora



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 1
Very High	Ecological support area 1
Very High	Ecological support area 2
Very High	Strategic Water Source Areas
Very High	Koue Bokkeveld Mountain Catchment Area

Figure 25. The map of relative terrestrial biodiversity theme sensitivity indicating a very high status.

9. The Vegetation

According to the Vegetation map of South Africa, Lesotho, and Swaziland (Mucina *et al.*, 2005; Mucina *et al.* 2006; SANBI 2018), only one vegetation type occurs in the Visgat study area, namely **Winterhoek Sandstone Fynbos** (Figure 23).

Winterhoek Sandstone Fynbos covers a wide area on the mountains of the Groot Winterhoek, Witzenberg, Skurweberg and Waboomsberg. The fynbos vegetation within the Winterhoek Sandstone Fynbos vegetation unit is variable depending on the location. In the Visgat study area the vegetation is mostly low closed restioid shrublands with some ericoid elements and emergent Proteaceae, notably *Protea laurifolia*. Since the vegetation was burnt in the recent past, the tall proteas have not reached their height as at maturity, except at the Site 3 road upgrade site where the vegetation survived the fire.

Detailed descriptions of each site follow below.

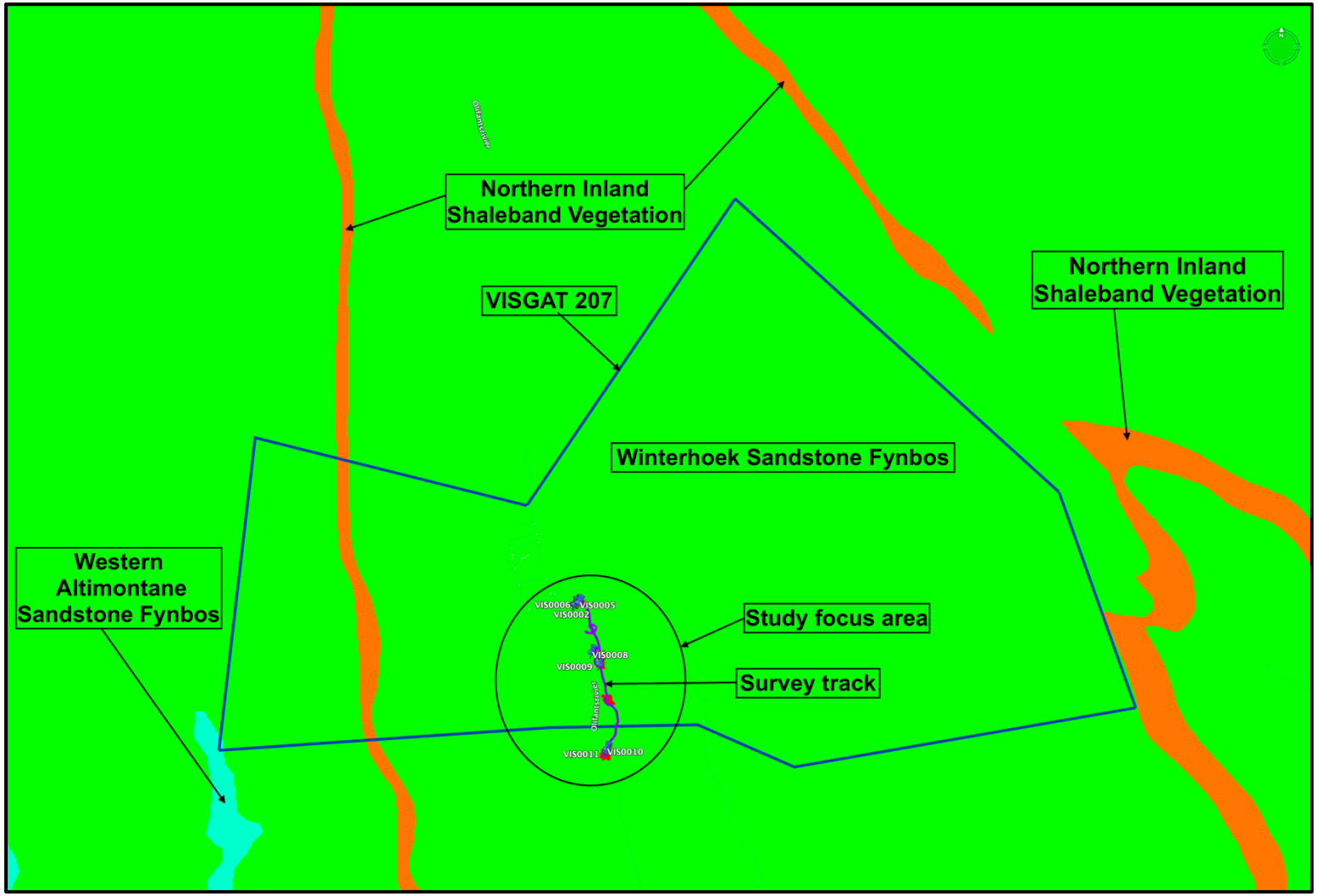


Figure 26. Portion of the *Vegetation map of South Africa, Lesotho, and Swaziland* (Mucina, Rutherford & Powrie 2005; SANBI, 2018) superimposed on a Google Earth ™ image, showing that the Visgat study area falls entirely in Winterhoek Sandstone Fynbos.

9.2.3 The vegetation recorded in the Visgat study area.

In all, twelve (14) waypoints were recorded where lists of plant species were made with habitat descriptions as given below.

VIS0001: S 33° 04' 36.59" E 19° 12' 58.90"

The bridge and road alignment will be on the upstream side, that is the southern side of the existing bridge and road (see Figures 15 & 30). On the west side, some of the fruit orchard would have to be sacrificed (Figure 27). The riparian vegetation (Figure 29) is azonal is and is more correctly described as Fynbos Riparian Vegetation (Mucina *et al.* 2006).

At this waypoint there is a remnant of the local fynbos but all around it is very disturbed by mechanical disturbance.

Plant species recorded:

Anthospermum aethiopicum, Athanasia trifurcata, Chrysocoma ciliata, Diospyros glabra, Ehrharta ramosa, Eragrostis curvula, Pelargonium rapaceum, Protea laurifolia, Searsia angustifolia, Seriphium plumosum and Thesium virgatum.

The substrate is white to grey sand with large sandstone boulders.

Figure 27. The existing bridge over the Olifants River at Visgat with fynbos vegetation in the foreground (east side), riparian vegetation along the river and fruit orchards on the west side of the river.

Figure 28. The route of the realigned road and bridge will result in removal of the fynbos vegetation in the foreground and west of the river as well as the riparian vegetation seen here. Part of the fruit orchard on the west side may also be lost.

Figure 29. The main channel of the Olifants River where the new bridge would be built.

Figure 30. The existing bridge on the right side of the photo with disturbed riparian zone immediately south of the bridge (left side).

VIS0002: S 33° 04’ 36.5” 5 E 19° 12’ 59.32 “

This location is on the west bank of the Olifants River. The vegetation is riparian thicket that is mid-high to tall (Figure 31). *Prionium serratum* (palmiet) lines the bank of the river (Figure 29).

Other plant species recorded:

Athanasia trifurcata, Diospyros glabra, Ehrharta ramosa, Euryops sp., Helichrysum sp., Metrosideros angustifolia, Pelargonium rapaceum (Figure 33), *Pelargonium grandiflorum* (Figure 32), *Pentaschistis colorata, Seriphium plumosum* and *Thesium virgatum.*

Figure 31. Riparian thicket on the banks for the Olifants River.

Figure 32. Flowers of *Pelargonium grandiflorum*.

Figure 33. Inflorescence of *Pelargonium rapaceum*.

VIS0003: S 33° 04’ 35.92” E 19° 13’ 0.51”

This location is at the main channel of the river where there is alluvial white sand.

Plant species in the riparian thicket:

*Acacia mearnsii** (Figure 35) *Cliffortia strobilinum, Diospyros glabra, Merxmuellera cincta, Metrosideros angustifolius, Prionium serratum, Psoralea pinnata, Rhodocoma fruticosa, Searsia angustifolia, Selago sp.* and *Seriphium plumosum.*

Figure 34. The transitional zone from the fynbos on the east side of the Olifants River to the riparian vegetation alongside the river.

Figure 35. Invasive exotic *Acacia mearnsii* (black wattle) [tall shrub in centre] must be eradicated.

VIS0004: S 33° 04’ 35.83” E 19° 13’ 0.61”

The same riparian vegetation as found at VIS0003, with the addition of *Ehrharta ramosa* and *Athanasia trifurcata*.

Figure 33. *Athanasia trifurcata* and *Seriphium plumosum* in the disturbed zone immediately south of the existing bridge.

VIS0005: S 33° 04’ 36.0” E 19° 13’ 01.1”

There is an abrupt change from the riparian vegetation to fynbos on the east side of the Olifants River. The west-facing slope is rocky (with some sandstone bedrock). The vegetation is in an early post-fire phase, typified by the tall *Othonna corymbosa* and *Thesium virgatum* (Figures 34 & 35).

Plant species recorded are: *Anthospermum aethiopicum, Centella sp., Centella sp. (2)*, *Cliffortia ruscifolia*, *Crassula fascicularis, Ehrharta sp. (not E. ramosa), Eragrostis capensis, Liechtensteinia lacera, Micranthus junceus, Montinia caryophyllaceae*, *Othonna corymbosa, Pelargonium grandiflorum, Phylica sp, Restio sieberi, Searsia rosmarinifolia, Stoebe plumosa, Struthiola ciliata, Tenaxia stricta, Thesium virgatum, Tritoniopsis antholyza, Wahlenbergia sp., Watsonia angusta* and *Willdenowia sulcata.*

The substrate is very rocky with large boulders and bedrock. The habitat is not sensitive.

Figure 34. Rock substrate on the east side of the Olifants River alongside the existing access road.

Figure 35. The re-alignment of the access road near the bridge would result in loss of some of the fynbos on the boulder slope seen here.

VIS0006: S 34° 04’ 35.82” E 19° 13’ 00.61”

This area, Area 1, was previously cultivated. It is now fallow and supports a community of ruderal plants that have colonized the disturbed terrain. The dominant shrubs are *Athanasia trifurcata* and *Seriphium plumosum* (Figures 36—38). Invasive alien *Acacia mearnsii** is present and must be eradicated.

Other plant species recorded are:

Bromus diandrus, Ehrharta villosa, Eragrostis curvula, Helichrysum sp.*, Pennisetum clandestinum* (exotic Kikuyu grass) [Figure 39], *Plantago lanceolata* and *Senecio* sp.

The seasonal stream on the southern side of Area 1 must be buffered from the effects of development of Area 1.

Figure 36. Agricultural Area 1 showing clear signs of historic cultivation.

Figure 37. *Athanasia trifurcata* (yellow flowers) is an aggressive invader of disturbed fallow land.

Figure 38. Area 1 lies close to the foot slopes of the mountain to the east of the Olifants River.

Figure 39. A significant part of the agricultural Area 1 is invaded by exotic Kikuyu grass (*Pennisetum clandestinum*).

VIS0007: S33° 04’ 35.82” E 19° 13’ 00.61”

Area 2 is a mowed soccer field, dominated by tufts of *Eragrostis curvula* (Figures 40 & 41). This is a major disturbance. The area is underlain by alluvial sediments (sand) brought down by the Olifants River. The NW corner of the site is also highly disturbed. It is dominated by ruderal weeds.

The stream and riparian vegetation must be buffered.

Capsella bursa-pastoris, Conyza bonariensis*, Vernonia bonariensis*, Rapistrum rugosum*, Taraxacum officinale*, Athanasia trifurcata* (not much!), *Bromus diandrus*, Ehrharta* cf. *villosa* and *Seriphium plumosum*.

Figure 40. The soccer pitch with sowed *Eragrostis curvula* that is regularly mowed.

Figure 41. The soccer pitch in the proposed agricultural Area 2, completely transformed from fynbos to a mowed grassveld.

Figure 42. The area to the north of the soccer pitch is completely transformed from fynbos vegetation. Heaps of mown vegetation are at the northern extreme of the area proposed as the Area 2 agricultural area.

VIS0008: S 33° 04’ 35.82” E 19° 13’ 00.61”

This waypoint is located on the southern part of agricultural area, Area 3. The disturbance regime is given above under 7.1.3.

The previously disturbed area has restored to fynbos (Figures 43 & 44) and it burnt 3—4 years ago. The dominant tall shrubs are *Othonna corymbosa* and *Thesium virgatum*.

Other species:

Anthospermum aethiopicum, Arctotheca calendula, Aspalathus sp., *Athanasia trifurcata, Ceratocaryum* sp., *Cliffortia ruscifolia, Ehrharta* cf. villosa, *Eragrostis curvula, Erica pluketii subsp. breviflora, Euryops sp., Leysera gnaphalodes, Lobostemon* sp., *Montinia caryophyllacea, Pelargonium cf. crispum, Plantago lanceolata, Protea laurifolia, Restio capensis, Restio sieberi, Seriphium plumosum, Syncarpha* cf. *paniculata, Tetraria ustulata, Thesium* sp. *(dwarf plant), Trifolium angustifolium, Tritoniopsis antholyza, Wahlenbergia* sp., *Willdenowia sulcata.*

Figure 43. The vegetation in the proposed Area 3 agricultural area consists of young fynbos dominated by Restionaceae.

Figure 44. The early stages of recovery after fire of the undisturbed fynbos vegetation in part of the area proposed for agriculture, Area 3.

VIS0009: S 33° 04’ 54.24” E 19° 13’ 06.66”

This waypoint is located on the Site 1 road upgrade area. The terrain is rocky, and the area has not been previously cultivated but burnt 3—4 years ago (Figure 45). The vegetation is young restioid shrubland with emergent *Protea laurifolia.* Notable but not rare species are *Dilatris ixioides* (Figure 46) and *Serruria pedunculata* (Figure 47).

Other plant species recorded include:

Bobartia sp.*, Cannomois* sp.*, Cliffortia ruscifolia, Crassula fascicularis, Dilatris ixioides, Elegia filacea, Heterolepis aliena, Leucadendron rubrum, Liechtensteinia lacera, Metalasia* sp.*, Montinia caryophyllacea, Othonna corymbosa, Phylica* sp.*, Protea laurifolia, Seriphium plumosum, Seriphium spirale, Serruria pedunculata, Syncarpha paniculata, Tenaxia stricta, Tetraria ustulata, Thesium* sp. *(low shrub), Ursinia* sp.*,* and *Wahlenbergia* sp.

Figure 45. Historically undisturbed fynbos except for the effects of the most recent fire. Road upgrade Site 1 lies in this habitat.

Figure 46. *Dilatris ixioides* (Family: Haemodoraceae)

Figure 47. *Serruria pedunculata* (Family: Proteaceae)

VIS0010: S 33° 04’ 58.53” E 19° 13’ 10.11”

This waypoint is at the northern end of the road upgrade Site 2.

The same plant community as found at VIS0009 with similarly young veld after fire is found at this location. The terrain is very rocky, with some exposed bedrock (Figures 48 & 49).

Additional plant species recorded here and not at VIS0009 are:

Cliffortia sp., *Corymbium* sp., *Erica inflata* and *Eriocephalus africanus*

Figure 48. Looking northwards from the area proposed for the Site 2 re-alignment section.

Figure 49. Looking southwards along the Site 2 re-alignment section of the access route.

VIS0011: S 33° 05’ 12.11” E 19° 13’ 13.31”

This waypoint is located approximately mid-way along the proposed road upgrade section Site 2 (Figure 50) where there is some localized disturbance apparently for sand and gravel for road building.

Cannomois virgata, Carpha glomerata, Cliffortia ruscifolia, Crassula sp., *Dilatris ixioides, Elegia* sp., *Erica inflata, Metrosideros angustifolia, Micranthus junceus, Muraltia heisteria, Ornithogalum hispidum, Othonna corymbosa, Pennisetum macrourum, Thesium virgatum, Watsonia angusta.*

Figure 50. Disturbed area apparently scraped for road building material.

VIS0012: S 33° 05’ 13.86” E 19° 13’ 14.43”

The ‘new route’ of Site 2 also runs through a significant seasonal stream and perennial seep. The habitat is very sensitive and all precautions possible must be taken to prevent negative impacts on the stream and wetland.

This waypoint was recorded where the road would cross a significant area of sandstone bedrock with the perennial stream running along one side of the rock slab and over loose boulders (Figure 51 & 52). The vegetation is the same community as recorded at VIS0011. *Cannomois virgata* (Restionaceae) is found along the course of the stream (Figure 53).

Figure 51. The seasonal stream over which the Site 2 road upgrade would be aligned, here running over bedrock.

Figure 52. The seasonal stream over which the Site 2 road upgrade would be aligned, here running over loose boulders.

Figure 53. The seasonal stream over which the Site 2 road upgrade would be aligned, with *Cannamois virgata* in the foreground.

VIS0013: S33° 5’ 29.80” E 19° 13’ 13.25”

The road upgrade Site 3 is outside the southern boundary of Farm Waypoint 207. The waypoint VIS0013 is at the northern point of meeting of the proposed new ‘upgrade section’ of the road with the existing road (Figure 54) at Site 3. The two white lines on the photograph in Figure 54 indicate the approximate route the ‘upgrade section’.

The upgrade route goes through undisturbed, mature and unburnt veld. The negative impact would be high and added to this is that the route will cross a well-defined perennial stream and associated wetland.

Figure 54. The northern intersection points between the existing road and the upgraded, re-aligned section of Site 3. The white lines indicate the approximate alignment of the new road section through mature fynbos vegetation.

VIS0014: S 33° 05’ 30.67” E 19° 13’ 13.09”

This waypoint was recorded at the stream at Site 3 of the road upgrade. The presence of *Leucadendron salicifolium*, *Cannomois virgata* and *Metrosideros angustifolius*, indicates perennial wetness (Figure 55—57). The proposed route goes directly over the stream so stringent mitigation measures would be required to limit negative impacts on the watercourse and surrounding habitat.

Figure 55. The Site 3 upgrade route would traverse unburnt vegetation in good condition and then a perennial stream.

Plant species recorded:

Calopsis sp., *Cassytha ciliolata, Corymbium* sp., *Dilatris ixioides, Elegia* sp. –tall, *Erica inflata, Erica* sp. (very small flowers), *Euphorbia tuberosa, Leucadendron salicifolium, Metrosideros angustifolia, Protea laurifolia, Pteronia* sp., *Seriphium spirale, Syncarpha* cf., *paniculata, Tenaxia stricta, Thamnochortus* sp., *Thesium virgatum* and *Watsonia angusta.*

Figure 56. Strong growth of *Cannomois virgata* with *Leucadendron salicifolium* in the vicinity of the stream.

Figure 57. Tall *Leucadendron salicifolium* with *Cannomois virgata* at the VIS0014 waypoint.

10. Plant Species of Conservation Concern

No species of conservation concern (SCC), often called Red Data or Red List species (Raimondo *et al.* 1999), were found in the area surveyed. This is not surprising since the surface area that would be affected by the access road upgrade is relatively small, and the list of species generated by the environmental screening tool is drawn from a much more extensive area with more diverse habitats. As for the agricultural development areas, Area 1 has no fynbos habitat, Area 2 has a limited area of fynbos habitat and Area 3 has a significant area of undisturbed fynbos habitat but the vegetation is young and no species of conservation concern were found.

11. Conservation Status

CapeNature published the Western Cape Biodiversity Spatial Plan (BSP) in 2017 (Pool-Stanvliet *et al.* 2017). In which the various 'sensitivity' units are defined. They are as follows:

PA – Protected Areas: Areas that are proclaimed as protected areas under national or provincial legislation.

CBA1 – Critical Biodiversity Area 1: Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.

CBA2 – Critical Biodiversity Area 2: Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.

Ecological Support Areas (ESAs) are areas that are not essential for meeting regional or national biodiversity conservation targets. However, they support the functioning of protected areas and critical biodiversity areas and often are necessary for delivering ecosystem services. They have importance in biodiversity links, delivering ecosystem services and as climate change buffers.

ESA1 - Ecological Support Area 1: Areas that are ecologically functional (i.e., in a natural, near-natural or moderately degraded condition).

ESA2 - Ecological Support Area 2: Areas that are no longer ecologically functional and need restoration to reinstate ecologically functional systems.

Other natural areas: These are areas that have not been identified as a priority but retain most of their natural character. They are not required for meeting biodiversity conservation targets but are still important parts of the natural ecosystems.

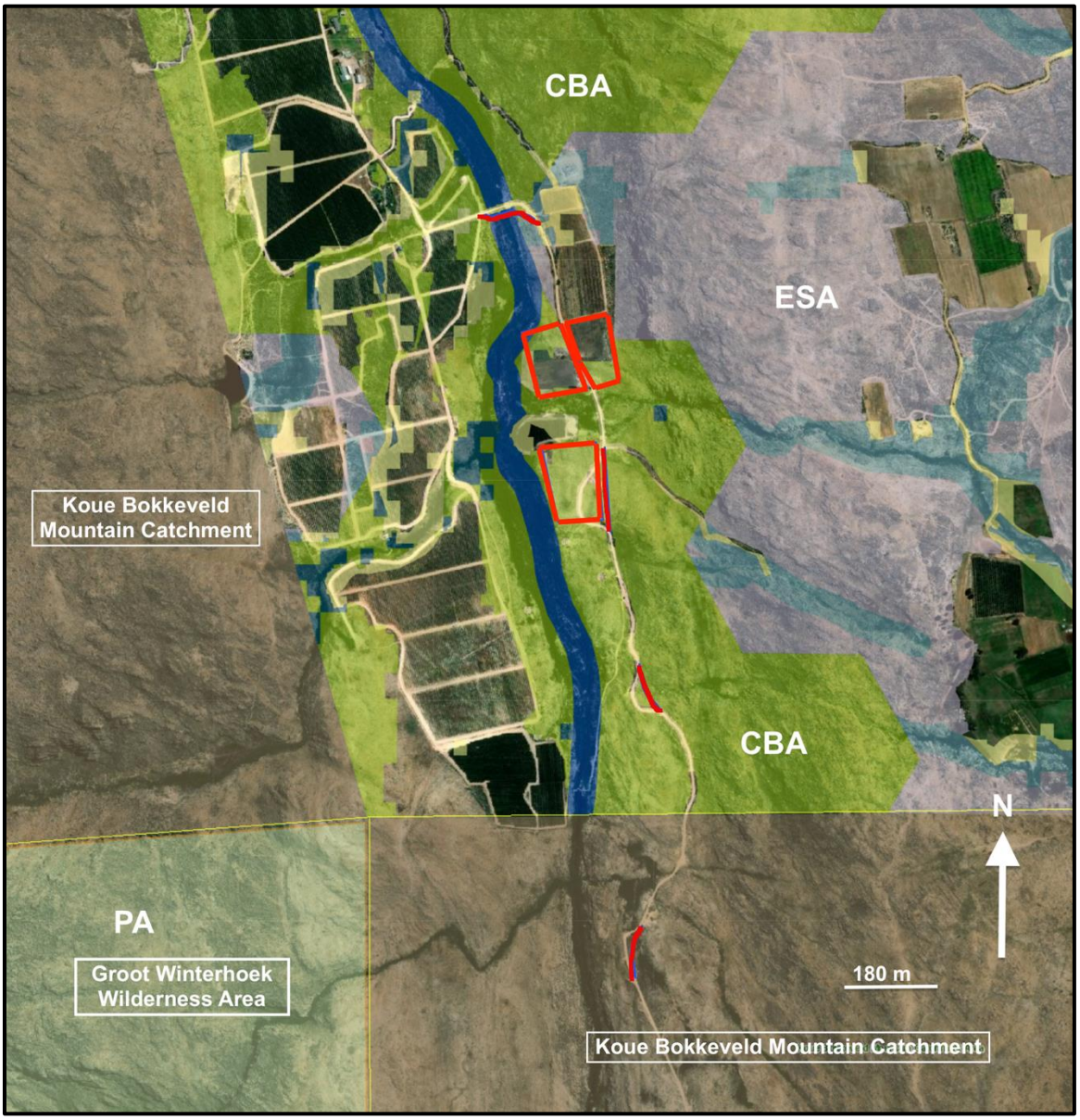


Figure 58. The conservation classification map for the Visgat 207 area, showing PA = Protected Area; CBA – Critical Biodiversity Areas; ESA – ecological support areas, and the Koue Bokkeveld Mountain Catchment Areas. The areas of proposed change are shown in red.

The new bridge, road upgrade sections Site 1 and Site 2, part of agricultural development Area 1, part of agricultural development Area 2 and the whole of agricultural development Area 3 are classified as Critical Biodiversity Areas. The road upgrade Site 3 falls within the Koue Bokkeveld Mountain Catchment. This indicates that all the locations where change through implementation of the road upgrade and agricultural development is proposed, are within ecologically sensitive areas.

12. Impact Assessment for the agricultural development areas

12.1 Alternatives

The following alternatives are considered in the impact assessment:

- 'No Go' Alternative, detailed in section 12.1.1 below.
- Development alternative

12.1.1 'No Go' Alternative

In the case of the **"No Go" alternative** where there would be no change to the *status quo*. The 'no development' alternative would thus have a **Low Negative** impact on the proposed agricultural development target areas, with no significant further loss of Winterhoek Sandstone Fynbos in the short- to long-term. The land would remain in its natural state and any changes that would occur would only be attributable to agriculture and external factors such as climate change. The 'No Go' alternative is included in the impact tables below (Tables 1 & 2).

12.1.2 Direct Impacts

Direct impacts are those that would occur directly on the natural vegetation resulting from development of the proposed agricultural areas.

The impacts of the proposed agriculture (orchards) are considered with respect to loss of vegetation type and habitat including plant species due to 'construction' and operational activities. Ecological processes are intrinsic to the habitat and are not separated here for assessment but rather the assessment incorporates the effect on ecological processes as part of the affected habitat. Only the 'No Go' alternative and one development alternative are assessed for each of the three agricultural areas.

12.1.3 Loss of Winterhoek Sandstone Fynbos in the proposed agricultural development areas

The proposed agricultural development will target areas that are mostly those that have been disturbed by historical agricultural activities or other activities (e.g. creation of a soccer pitch). The exception is Area 3 where the major disturbance is the existing road, otherwise in Area 3 the habitat consists of undisturbed fynbos that would be developed.

The direct impact during the construction phase on Area 1 and Area 2 would be **Very Low Negative** without mitigation. Mitigation would not be necessary. The direct impact on Area 3 would be **High Negative** and mitigation would be necessary to lower the negative impact (Table 1).

The direct impact during the operational phase would be **Very Low Negative** on all the proposed agricultural areas (Table 2).

Table 1. Impact of the loss of Winterhoek Sandstone Fynbos in the agricultural development areas, during the construction phase.

CRITERIA	**'NO GO' ALTERNATIVE**	**AREA 1**		**AREA 2**		**AREA 3**	
Nature of direct impact (local scale)	Loss of Winterhoek Sandstone Fynbos						
		WITHOUT MITIGATION	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**
Extent	Local	Local	Local	Local	Local	Local	Local
Duration	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term
Intensity	Low	Very Low	Very Low	Low	Very low	High	Medium
Probability of occurrence	Probable	Definite	Definite	Definite	Definite	Definite	Definite
Confidence	High	High	High	High	High	High	High
Significance	Very Low Negative	Very Low Negative	Very Low Negative	Very Low Negative	Very Low Negative	High Negative	Medium Negative
Nature of cumulative impact	Loss of Winterhoek Sandstone Fynbos						
Cumulative impact prior to mitigation	N/A	Very Low Negative		Very Low Negative		Low Negative	
Degree to which impact can be reversed	N/A	Low		Low		Low	
Degree to which impact may cause irreplaceable loss of resources	N/A	Very low		Very Low		Medium (moderate)	
Degree to which impact can be mitigated	N/A	Not required		Not required		Medium (moderate)	
Proposed mitigation	N/A	N/A		N/A		On-site offset on Farm Visgat 207	
Cumulative impact post mitigation	N/A	Very low negative		Very Low Negative		Low Negative	
Significance of cumulative impact (broad scale) after mitigation	N/A	Very low negative		Very Low Negative		Low Negative	

Table 2. Impact of the loss of Winterhoek Sandstone Fynbos in the agricultural development areas, during the operational phase.

CRITERIA	'NO GO' ALTERNATIVE	AREA 1		AREA 2		AREA 3	
Nature of direct impact (local scale)	Loss of Winterhoek Sandstone Fynbos						
		WITHOUT MITIGATION	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**
Extent	Local	Local	Local	Local	Local	Local	Local
Duration	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term
Intensity	Low	Very Low	Very Low	Low	Very low	High	Medium
Probability of occurrence	Probable	Definite	Definite	Definite	Definite	Definite	Definite
Confidence	High	High	High	High	High	High	High
Significance	Very Low Negative	Very Low Negative	Very Low Negative	Very Low Negative	Very Low Negative	Very Low Negative	Very Low Negative
Nature of cumulative impact	Loss of Winterhoek Sandstone Fynbos						
Cumulative impact prior to mitigation	N/A	Very Low Negative		Very Low Negative		Very Low Negative	
Degree to which impact can be reversed	N/A	Low		Low		Low	
Degree to which impact may cause irreplaceable loss of resources	N/A	Very low		Very Low		Very Low	
Degree to which impact can be mitigated	N/A	Not required		Not required		Not required	
Proposed mitigation	N/A	N/A		N/A		N/A	
Cumulative impact post mitigation	N/A	N/A Very Low Negative		Very Low Negative		Very Low Negative	
Significance of cumulative impact (broad scale) after mitigation	N/A	Very Low negative		Very Low negative		Very Low negative	

13. Impact Assessment for the road upgrade sites

13.1 Alternatives

The following alternatives are considered in the impact assessment:

- 'No Go' Alternative, detailed in section 13.1.1 below.
- Location alternatives: Sites 1--3

13.1.1 'No Go' Alternative

In the case of the **"No Go" alternative** where there would be no change to the *status quo*. The 'no development' alternative would thus have a **Very Low Negative** impact on the areas proposed for the road upgrade. The terrain would remain in its natural state and any changes that would occur would only be attributable to abiotic factors such as fire and climate change. The 'No Go' alternative is included in the impact tables below (Tables 3 & 4).

13.1.2 Direct Impacts

Direct impacts are those that would occur directly on the natural vegetation resulting from the proposed bridge and road upgrade at the bridge site and three other sites. No alternative sites could be implemented due to the nature of the project, thus the assessment is for the No Go and for the road upgrade as described above, during the construction phase (Table 3) and operational phase (Table 4).

13.1.3 Loss of Winterhoek Sandstone Fynbos due to the upgrade of the Visgat access road and bridge

The proposed road and bridge upgrade will target areas that are mostly undisturbed habitat. The impact at a local scale is anticipated to be **High Negative** for the bridge and road re-alignments during the construction phase without any mitigation and **Medium Negative** after mitigation (Table 3). For the operational phase, the direct impact would be **Low Negative** before and after mitigation (Table 4).

Table 3. Impact of the loss of Winterhoek Sandstone Fynbos at the road and bridge upgrade site, during the construction phase.

CRITERIA	**'NO GO' ALTERNATIVE**	**BRIDGE**		**SITE 1**		**SITE 2**		**SITE 3**	
Nature of direct impact (local scale)	Loss of Winterhoek Sandstone Fynbos								
		WITHOUT MITIGATION	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**
Extent	Local	Local	Local	Local	Local	Local	Local	Local	Local
Duration	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term
Intensity	Low	High	Very Low	Medium	Low	Low	Very low	High	Medium
Probability of occurrence	Probable	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Confidence	High	High	High	High	High	High	High	High	High
Significance	Very Low Negative	Very Low Negative	Very Low Negative	Medium Negative	Low Negative	Low Negative	Very Low Negative	High Negative	Medium Negative
Nature of cumulative impact	Loss of Winterhoek Sandstone Fynbos								
Cumulative impact prior to mitigation	N/A	Low Negative		Very Low Negative		Low Negative		Low Negative	
Degree to which impact can be reversed	N/A	Low		Medium		Low		Low	
Degree to which impact may cause irreplaceable loss of resources	N/A	Very low		Low		Low		Low	
Degree to which impact can be mitigated	N/A	Medium		Medium		Low		Low	

Proposed mitigation	N/A	Allow vegetation to grow back naturally. This should be assisted by stabilising the riverbanks. Any *Prionium serratum* removed during construction should be retained and replanted to enhance the restorative process.	Rehabilitation of vegetation in the abandoned section of road.	Rehabilitation of vegetation in the abandoned section of road. Culverts must be built to allow the stream to flow naturally.	Rehabilitation of vegetation in the abandoned section of road. Culverts must be built to allow the stream to flow naturally.
Cumulative impact post mitigation	N/A	Very Low Negative	Low negative	Low negative	Medium negative
Significance of cumulative impact (broad scale) after mitigation	N/A	Very Low Negative	Low negative	Low negative	Low negative

Table 4. Impact of the loss of Winterhoek Sandstone Fynbos at the road and bridge upgrade site, during the operational phase.

CRITERIA	'NO GO' ALTERNATIVE	BRIDGE		SITE 1		SITE 2		SITE 3	
Nature of direct impact (local scale)	Loss of Winterhoek Sandstone Fynbos								
		WITHOUT MITIGATION	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**	**WITHOUT MITIGATION**	**WITH MITIGATION**
Extent	Local	Local	Local	Local	Local	Local	Local	Local	Local
Duration	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term
Intensity	Low	Very Low	Very Low	Low	Low	Low	Very low	High	Medium
Probability of occurrence	Probable	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Confidence	High	High	High	High	High	High	High	High	High
Significance	Very Low Negative	Very Low Negative	Very Low Negative	Low Negative	Low Negative	Low Negative	Low Negative	Low Negative	Low Negative
Nature of cumulative impact	Loss of Winterhoek Sandstone Fynbos								
Cumulative impact prior to mitigation	N/A	Very Low Negative		Low Negative		Low Negative		Low Negative	
Degree to which impact can be reversed	N/A	N/A		N/A		N/A		N/A	
Degree to which impact may cause irreplaceable loss of resources	N/A	N/A		Very Low		Very Low		Very Low	
Degree to which impact can be mitigated	N/A	Not required		Not required		Not required		Not required	
Proposed mitigation	N/A	N/A		N/A		N/A		N/A	

14. Indirect impacts

By definition, indirect impacts occur away from the 'action source' i.e., away from the development site. The impact assessed here is specifically how the proposed development would have an indirect impact on vegetation and flora away from the development site. Such indirect impacts would be negligible and insignificant.

15. Cumulative impacts

The proposed further development of agricultural areas at Farm Visgat 207 would have a relatively low negative cumulative impact on Winterhoek Sandstone Fynbos. This ecosystem has a high ecological resilience† due to the extensive nature of the vegetation type in mountain catchments that foreseeably will not be developed in any way.

16. Mitigation

The only mitigation that could be applied for the loss of approximately 2 ha of Winterhoek Sandstone Fynbos would be to set aside some of the same vegetation type as a conservation offset. However, there is extensive conservation of this vegetation type on Farm Visgat 207 simply because it cannot be developed. Therefore, an onsite conservation offset is spurious since such an offset would not result in any net gain for conservation. The same argument is applicable for any suggestion of offset for the loss of fynbos vegetation at the road re-alignment sites.

17. General Assessment and Recommendations

- A single vegetation type is found in the study area; Winterhoek Sandstone Fynbos.
- This vegetation type is not threatened according to the National List of Threatened Ecosystems (Government Gazette, 2011).
- No rare or threatened plant species were found during the survey. The probability of the occurrence of species of conservation concern (SCC) is low, but not impossible, within the area surveyed.
- There is general agreement between the results of this study and the output of the National Web-based Environmental Screening Tool for the sites surveyed where plant sensitivity is medium.

† **ecological resilience**, also called **ecological robustness**, the ability of an ecosystem to maintain its normal patterns of nutrient cycling and biomass production after being subjected to damage caused by an ecological disturbance. The term *resilience* is a term that is sometimes used interchangeably with *robustness* to describe the ability of a system to continue functioning amid and recover from a disturbance (Source: https://www.britannica.com/science/ecological-resilience)

- Terrestrial biodiversity sensitivity of the surveyed area is very high according to the screening tool. This is attributed to the screening tool applying the sensitivity of the entire ecosystem to a small area within it. To the observer at the local scale, terrestrial biodiversity sensitivity is no more than medium.
- Based on the data collected and analyzed for the target area for the development of the agricultural areas and realignment of the road, no fatal flaws or any other obstacles were found with respect to the flora, vegetation as a whole and terrestrial biodiversity.

18. Conclusions

The conditions for the field survey of the vegetation and habitat found at Visgat 207area were optimal at the time of the survey. This was ideal for plant identification and led to the results and conclusions being robust. The only limitation was that some winter- and spring-flowering geophytes would have been missed but it is assumed that these would be low in number and therefore not decisive with respect to the outcome of the assessment.

This report will form part of the Draft Basic Assessment Report (DBAR) that will be released for a 30-day comment period. Any comments received or questions raised concerning this report will then be considered after the public participation period.

19. References

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Report submitted: 28 May 2022

Appendix 2: Curriculum Vitae

Dr David Jury McDonald Pr. Sci. Nat.

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Profession: Botanist / Vegetation Ecologist / Consultant / Tour Guide

Date of Birth: 7 August 1956

Employment history:

- 19 years with National Botanical Institute (now SA National Biodiversity Institute) as researcher in vegetation ecology.
- Five years as Deputy Director / Director Botanical & Communication Programmes of the Botanical Society of South Africa
- 16 years as private independent Botanical Specialist consultant (Bergwind Botanical Surveys & Tours CC)

Nationality: South African (ID No. 560807 5018 080)
Languages: English (home language) – speak, read and write
Afrikaans – speak, read and write

Membership in Professional Societies:

- International Association for Impact Assessment (SA)
- South African Council for Natural Scientific Professions (**Ecological Science, Registration No. 400094/06**)
- Field Guides Association of Southern Africa

Key Qualifications:

- Qualified with a M. Sc. (1983) in Botany and a PhD in Botany (Vegetation Ecology) (1995) at the University of Cape Town.
- Research in Cape fynbos ecosystems and more specifically mountain ecosystems.
- From 1995 to 2000 managed the Vegetation Map of South Africa Project (National Botanical Institute).
- Conducted botanical survey work for AfriDev Consultants for the Mohale and Katse Dam projects in Lesotho from 1995 to 2002. A large component of this work was the analysis of data collected by teams of botanists.
- **Director: Botanical & Communication Programmes** of the Botanical Society of South Africa (2000—2005), responsible for communications and publications; involved with conservation advocacy particularly with respect to impacts of development on centres of plant endemism.
- Further tasks involved the day-to-day management of a large non-profit environmental organisation.
- **Independent botanical consultant** (2005 – to present) over 300 projects have been completed related to environmental impact assessments in the Western, Southern and Northern Cape, Karoo and Lesotho. A list of reports (or selected reports for scrutiny) is available on request.

Higher Education

Degrees obtained
and major subjects passed:

B.Sc. (1977), University of Natal, Pietermaritzburg
Botany III
Entomology II (Third year course)

B.Sc. Hons. (1978) University of Natal, Pietermaritzburg
Botany (Ecology /Physiology)

M.Sc. - (Botany), University of Cape Town, 1983.
Thesis title: 'The vegetation of Swartboschkloof, Jonkershoek, Cape Province'.

PhD (Botany), University of Cape Town, 1995.
Thesis title: 'Phytogeography endemism and diversity of the fynbos of the southern Langeberg'.

Certificate of Tourism: Guiding (Culture: Local)
Level: 4 Code: TGC7 (Registered Tour Guide: WC 2969).

Employment Record:

January 2006 – present: Independent specialist botanical consultant and tour guide in own company:
Bergwind Botanical Surveys & Tours CC

August 2000 - 2005 : Deputy Director, later Director Botanical & Communication Programmes, Botanical Society of South Africa

January 1981 – July 2000 : Research Scientist (Vegetation Ecology) at National Botanical Institute

January 1979—Dec 1980 : National Military Service

Further information is available on my company website: www.bergwind.co.za