

PROPOSED GOD'S WINDOW SKYWALK PROJECT

**Terrestrial Biodiversity (Vegetation) assessment and
Plant Species Assessment-Version 2**

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The Environmental Impact Assessment Regulations (Government Notice No. R982 of 4 December 2014), requires that certain information is included in specialist reports. The terms of reference, purpose of the report, methodologies, assumptions and limitations, impact assessment and mitigation (where relevant to the scope of work) and summaries of consultations (where applicable) are included within the main report. Other relevant information is set out below:

Expertise of author:

- Working in the field of ecology, and in specific vegetation related assessments, since 2007;
- Is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions in the field of ecology (Reg. No. 400019/11); and
- Has been working with plants indigenous to South Africa since 1997.

Declaration of independence:

Dimela Eco Consulting in an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by Dimela Eco Consulting is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

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Dimela Eco Consulting undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to Dimela Eco Consulting by the client, and in addition to information obtained during the course of this study, Dimela Eco Consulting present the results and conclusion within the associated document to the best of the authors professional judgement and in accordance with best practise.

Antoinette Eyssell-Knox
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____ 2022
Date

EXECUTIVE SUMMARY

Zutari (in conjunction with other partners) has been appointed for the management of the God's Window Skywalk project. A business ownership model for the project has been developed and a Public Private Partnership (PPP) agreement has been formed with Mapulana Canyon (Pty) Ltd for the design, finance, build, operate and transfer of the project.

Dimela Eco Consulting was appointed to assist with the vegetation assessment for the proposed development. A vegetation assessment, forming part of an Ecological Report, was undertaken for the site in the year 2013 by Strategic Environmental Focus (SEF, 2013). Dimela Eco Consulting was tasked to verify the existing vegetation report, to undertake a field survey and update the report to satisfy the requirements of the Protocols for terrestrial biodiversity (vegetation) assessment, as well as a terrestrial plant species assessment, as published in the Government Gazette No 43310 on 20 March 2020 and Government Gazette No 43855 on 30 October 2020 in terms of sections 24(5)(a) and 25 (5)(h) of NEMA.

The following is relevant to the Protocols as detailed by the National Web based Environmental Screening Tool downloaded on the 20/01/2022 08:15:45:

- The site is classified as 'very high terrestrial biodiversity sensitivity'
- The property is also classified as high with a smaller section of medium for sensitive plant species, indicating that the site includes confirmed localities of some plant species of conservation concern, as well as suitable habitat for others.

Therefore, a terrestrial vegetation assessment, as well as a terrestrial plant species assessment, as published in the Government Gazette No 43855 on 30 October 2020 in terms of sections 24(5)(a) and 25 (5)(h) of NEMA, should be undertaken.

The National Web based Environmental Screening Tool report indicates that confirmed localities for two (2) plant species of conservation concern are present on or close to the site, while suitable habitat for another twenty-nine (29) species are likely present (the medium sensitivity). In addition, the historical report undertaken in 2013, confirmed the occurrence of the two species, as well as an additional three (3) species of conservation concern. This report thus undertook to:

- Verify the vegetation communities as recorded in 2013 and amend where needed.
- Verify the persistence and population size (where possible due to steep cliffs) of plant species of conservation concern that was historically recorded by the 2013 assessment.
- Habitat assessment and Timed-Meander Surveys to search for additional plant species of conservation concern for which suitable habitat is present.

The terms of reference were as follows:

Complete a terrestrial plant assessment in line with the terrestrial biodiversity protocols, including

- Literature review including an existing ecological report of the site undertaken in the year 2013.

- Review existing spatial data and vegetation information for the area and supply background information on the site relating to conservation plans and threatened ecosystems. These will include updated sources to what was available in 2013.
- Field survey to verify the vegetation results of the 2013 assessment and amend vegetation communities where needed.
- Walk the existing walkways to determine if any protected trees / plants could be impacted on or will need to be pruned as part of an upgrade to the walkways.
- Report and map describing the vegetation communities found / verified on the site and its conservation importance and function within the landscape.
- Map indicating confirmed or potential habitat for plant species that are of conservation concern as well as ecologically sensitive vegetation groupings.
- Assessment and report on the impacts that the proposed development and related activities could have on the vegetation on site, as well as recommendations to limit or negate these perceived impacts.

The terms of reference for a terrestrial plant species assessment report were as follows:

- Up to five plant species of conservation concern have been confirmed to be present historically. The persistence of these and its local population size (where possible due to accessibility) will be determined.
- In addition, the field survey will focus on the identified suitable habitat for the plant species of conservation concern that has a medium probability of occurring, as determined by the terrestrial vegetation assessment. The timed meander survey method is proposed.
- If more species are identified that could be mapped in the time frame proposed, a follow-up assessment will be proposed.

The Project Area of Influence (PAOI) was defined as per the Species Environmental Assessment Guideline and was based on the development footprint and the potential extent of the impacts (e.g., edge effects) of the project activities. As per the available layout, the development will not destroy the entire area assessed. Thus, the proposed development footprint of the facilities was regarded as the primary PAOI. The Gods Window area was regarded as the secondary PAOI. Edge effects into a tertiary PAOI is likely, and include the cliff face and forest below, which could not be sampled. Some impacts may take place opposite of the R534 road, as the plantation areas could be used as construction camps. However, the locality of construction camps was not yet known, and the area was not assessed.

Background to the site

The study area is located at God's Window in the Mpumalanga Province approximately 7km north-east of Graskop and falls in Quarter Degree Grid (QDG) 2430DD. The R543 road forms the western boundary of the site. The assessed area entails about 10ha around current infrastructure at God's Window, including steep cliffs and inaccessible areas. About 5.5ha can be safely surveyed by foot, as well as the

existing footpaths. The proposed development will encompass about 2.2ha of the 10ha footprint, of which at least 5.5 ha was assessed.

The project falls within the summer rainfall area, with warm summers and cool winters. Summer rainfall usually exceeds 1 400 mm per annum, augmented by mist during large parts of the year. The study area is situated within two Biomes, namely the Forests Biome and the Grassland Biome. God's Window falls within the Blyderivierspoort Nature Reserve, which forms part of the larger Kruger to Canyon Biosphere Reserve. Three vegetation types occur within the area assessed namely: Northern Mistbelt Forest, Northern Escarpment Afromantane Fynbos and Northern Escarpment Quartzite Sourveld. The Northern Escarpment Quartzite Sourveld is classified as Vulnerable. According to the 2011 Listed Ecosystems, Gods Window falls within the Endangered Blyde Quartzite Grasslands. Although the National List of Threatened Terrestrial Ecosystems published in terms of the Biodiversity Act in 2011 remains in legal force, the data contained in the recent National Biodiversity Assessment (NBA) 2018 represents an update of the assessment of threat status for terrestrial ecosystems and classified the ecosystems that the site is situated in as Least Concern. The project is within the Mpumalanga Drakensberg & Northern Lowveld Escarpment Groundwater Strategic Water Source Areas (SWSA).

Findings:

The table below list the vegetation groups recorded within the project area, as well as its Site Ecological Importance (SEI):

Broad vegetation community		Site Ecological Importance (SEI) – mitigation
Scrubveld	<i>Passerina montana-Scleria transvaalensis</i>	Medium
	<i>Cliffortia linearifolia-Seripheum species A</i>	Medium
<i>Aloe arborescens-Clivia caulescens</i> cliff edge		Very High (Avoid)
Vegetation on vertical cliffs		Very High (Avoid)
Forest	Mistbelt forest	High
	Degraded forest	Medium

The project area is situated within a protected area and comprise mainly of natural vegetation that range from medium to very high sensitivity. The vegetation further includes sensitive and unique habitats, and several plant species of conservation concern were confirmed to occur or are highly likely to be present.

The proposed project will have an impact on sensitive vegetation which is difficult, if not impossible, to rehabilitate. Some impacts as listed below can be mitigated, however, some impacts can not.

The two proposed activities are discussed further below:

Skywalk development footprint

The greatest impact on vegetation will be the total removal of vegetation of medium sensitivity for the main development footprint and removal and edge effects of the very-high sensitivity *Aloe arborescens-Clivia caulescens* cliff edge vegetation. At the time of writing this report, the proposed layout of the development will have the following impacts:

Direct impacts during construction

- The current layout destroys the entire *Passerina montana -Scleria transvaalensis* scrubveld. The layout blocks any ecological corridors on the escarpment in a southerly and northerly direction and provides no "steppingstones" through the development. The original design in 2013 was smaller and humbly positioned with options to conserve portions of *Passerina montana -Scleria transvaalensis* scrubveld on either side of the development, including movement corridors.
- Destruction of the *Aloe arborescens-Clivia caulescens* cliff edge vegetation and sensitive plant species.
- Destruction of sensitive plant species on the vertical cliff (several threatened species can be impacted on).
- Falling objects impacting on the sensitive vegetation along and below the cliff.
- Introduction of alien invasive plant species to the area and lead to an increase of the invasive species already present.

Indirect impacts during construction and operating:

- Change in hydrology: if the scrubveld is developed it will impact the water regime / available water for vegetation on the cliff's edge, on the cliff, as well as the forest below.
- Overshadowing of the vegetation on the cliff face by the skywalk and skybridge.
- These structures could also have a rain shadow effect, or concentrate runoff along the cliff face, destroying vegetation in crevices.
- Falling objects impacting on the sensitive vegetation along and below the cliff (e.g. litter).
- Introduction of alien invasive plant species to the area, either as planted ornamentals or via visitors.
- Modification of natural vegetation: the vegetation within the development footprint might be landscaped and irrigated (including the use of species not naturally occurring in the area). This could change the species composition and abundance (or density) of the vegetation around the development footprint.

Upgrade of footpaths

The methodology and details of the upgrade were not known at the time of writing this report. However, the following impacts are envisaged but can be mitigated:

- Removal of damage to protected- and sensitive plant species, including the national protected tree *Podocarpus latifolius*.
- Change in current drainage along the footpaths that could channel stormwater into sensitive vegetation groupings.
- Trampling and damage to vegetation by workers and equipment.
- Pollution of soil by cement etc

The following is recommended to limit the foreseen impacts:

- Reduce the development footprint within the *Passerina montana -Scleria transvaalensis* scrubveld (medium sensitivity) and position the development based on recommendations of the wetland and geo-hydrology assessments. This will allow the persistence of this vegetation, while safeguarding the groundwater source that the species on the cliff face is likely dependent on.
- Reconsider the need for a skywalk compared to the need to conserve sensitive plant species. If the skywalk is developed, as best practise, the skywalk should be limited in its extent and thus resulting impacts.
- Avoid the use of foundations where possible, e.g., employ lightweight steel construction and stilts instead of digging foundations into the lateral waterflow.
- The development layout should be set back from the cliff edge to protect and conserve the *Aloe arborescens-Clivia caulenscens* cliff face vegetation. This vegetation includes a Vulnerable species, a Near-Threatened species as well as a Data deficient species. A setback of a minimum of 15m from the cliff edge will protect the vegetation from edge effects. Only the skybridge may traverse this vegetation and the access to the skywalk.

The findings of this specialist assessment caution against a development layout that will destroy the entire *Passerina montana -Scleria transvaalensis* scrubveld, which in turn will result in a (yet ill-understood) impact on the very sensitive vegetation on the cliff face. Once geo-hydrology and wetland assessments can shed light on the potential impact, this conclusion can be revised accordingly as the project could also improve the financial spending on conserving this unique habitat.

For ease of reference, the following table summaries results of the assessment as per the main requirements of the Protocols for Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial (Vegetation) Biodiversity as published on 20 March 2020.

Summary of the main terrestrial (vegetation) biodiversity findings

Biodiversity (vegetation) aspect	Result
<p>Conservation Plan Category: Protected area (Figure 8)</p>	<p>Impact on the ecological processes:</p> <ul style="list-style-type: none"> • As per the 2013 ecological and wetland report, the hydrology of the area seems interconnected and important in terms of regulating different moisture regimes in different areas, many areas serving as habitat harbouring a multitude of species of conservation concern (SEF, 2013 and 2014). These species are dependent on the wet conditions of some of the cliffs. The wet conditions of these cliffs are most probably caused by wetlands on the top of the escarpment, and it is therefore likely that disturbance caused to these wetlands will impact the water regimes on the vertical cliffs which will cause the moisture dependant species to die. • Construction and operation could cut off the waterflow to plant species of conservation concern growing on the cliff edge and on the vertical cliff. • The layout destroys most of the <i>Passerina montana</i> -<i>Scleria transvaalensis</i> scrubveld. The vegetated roof proposes to reinstate an ecological corridor on the escarpment in a southerly and northerly direction and provides a "stepping stones" through the development. • Fire in scrubveld maintain the species composition and vegetation structure. Fires will be prevented to safeguard infrastructure, which could result in a change of species composition. • Mismanagement of the vegetation and lack of rehabilitation could lead to encroachment by non-herbaceous or 'woody' species such as the bracken fern (<i>Pteridium aquilinum</i>) and <i>Cliffortia linearifolia</i> which were already present in large numbers. This could change ecotonal communities, which can tolerate fire. <p>Main objectives of Protected Areas in relation to this proposed project:</p> <ul style="list-style-type: none"> • All protected areas exist primarily for the purpose of securing biodiversity and maintaining the ecological integrity of the landscapes in which they are situated. The Protected Areas Act (Act 57 of 2003) requires that land-use and management in each protected area is governed by a formally approved management plan. Such plans identify allowable activities and allocate them to appropriate zones within the protected area. The management plan for the Blyderivers or Motlatse Canyon Provincial Nature Reserve was not available to the specialist at the time of writing this report. Where it is necessary to establish or expand infrastructure within a protected area, this should be carried out subject to the provisions of NEMA, the Protected Areas Act and its regulations. However, all operational aspects of managing protected areas are subject to their main purpose.

Biodiversity (vegetation) aspect	Result
	<ul style="list-style-type: none"> Thus, in the case of Gods Window, the area must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.
Listed ecosystems	<ul style="list-style-type: none"> According to the 2011 Listed Ecosystems, Gods Window falls within the Endangered Blyde Quartzite Grasslands. Although the National List of Threatened Terrestrial Ecosystems published in terms of the Biodiversity Act in 2011 remains in legal force, the data contained in the recent National Biodiversity Assessment (NBA) 2018 represents an update of the assessment of threat status for terrestrial ecosystems and classified the ecosystems that the site is situated in as Least Concern.
SWSA	<ul style="list-style-type: none"> According to Le Maitre <i>et al.</i> (2018), the project is in the Mpumalanga Drakensberg & Northern Lowveld Escarpment Groundwater SWSA. Only 2.63% of this strategic water source is currently protected. Gods Window forms part of a protected area and is thus important to conserve the Mpumalanga Drakensberg & Northern Lowveld Escarpment Groundwater SWSA. The hydrology of the area seems interconnected and important in terms of regulating different moisture regimes in different areas, many areas serving as habitat harbouring a multitude of species of conservation concern. Construction and operation will cut off the lateral waterflow to plant species of conservation concern growing on the cliff edge and on the vertical cliff. Erosion and pollution caused by clearing of vegetation for the development, could impact on the downstream water quality temporarily (e.g. during construction).
NFEPA	See wetland assessment
Indigenous forest:	<ul style="list-style-type: none"> The proposed development will destroy a portion (about 0.7ha) of degraded forest between the R534 road and the existing parking. The upgrade of the footpaths will have an edge effect into the surrounding indigenous forest as well as habitat of plant species of conservation concern, including orchids. The extent of this impact is not known as the actual upgrade footprint was not provided. The main development of the proposed project could have an indirect impact on indigenous forest below the cliff face. This could be caused by a change in hydrology, pollution and damage caused by falling objects.
No go areas	<ul style="list-style-type: none"> <i>Aloe arborescens-Clivia caulescens</i> cliff vegetation Vegetation on vertical cliffs may not be disturbed during construction of the skybridge and skywalk or allowed to dry out due to the development within the <i>Passerina montana-Scelria transvaalensis</i> scrubveld. Limit activities within the forest to the absolute minimum and prevent any indirect impacts to forests below the cliffs.
Plant species of conservation concern	<ul style="list-style-type: none"> Ten (10) species of conservation concern were confirmed to occur. Appendix C gives more details on the possible size of populations and provides a map

Biodiversity (vegetation) aspect	Result																					
	<p>wherein confirmed localities, including those confirmed in 2013 by SEF, are geographically represented.</p> <p>Number and threat status of confirmed and highly likely to occur species (see Appendix C for details)</p> <table border="1" data-bbox="488 495 1417 894"> <thead> <tr> <th>Threat status</th> <th>Number of species confirmed to occur</th> <th>Number of species that has a medium to high possibility of occurrence.</th> </tr> </thead> <tbody> <tr> <td>Endangered</td> <td>-</td> <td>2</td> </tr> <tr> <td>Vulnerable</td> <td>3</td> <td>3</td> </tr> <tr> <td>Near Threatened</td> <td>2</td> <td>-</td> </tr> <tr> <td>Data deficient (taxonomic problems)</td> <td>1</td> <td>-</td> </tr> <tr> <td>Rare</td> <td>4</td> <td>2</td> </tr> <tr> <td>Total</td> <td>10</td> <td>7</td> </tr> </tbody> </table> <p><u>Note the following:</u></p> <ul style="list-style-type: none"> Inaccessible areas were not sampled; however, the areas that will directly be impacted on by the skywalk and skybridge must be assessed to verify the species of concern, and the number of each, that will be directly impacted on the cliff face. This will involve abseiling along the final locality and anchor points of the skywalk and -bridge. The exact footprint of the upgrade of the footpaths must be provided to the specialist to assess the number of species of conservation concern, as well as national protected species, that will be impacted thereby. Some orchid species were not in flower and the species need to be confirmed in the flowering period. The pipeline route and locality of the Prestressed Steel Tank must be walked and all protected tree and plant species that will be affected must be marked for permit application purposes. 	Threat status	Number of species confirmed to occur	Number of species that has a medium to high possibility of occurrence.	Endangered	-	2	Vulnerable	3	3	Near Threatened	2	-	Data deficient (taxonomic problems)	1	-	Rare	4	2	Total	10	7
Threat status	Number of species confirmed to occur	Number of species that has a medium to high possibility of occurrence.																				
Endangered	-	2																				
Vulnerable	3	3																				
Near Threatened	2	-																				
Data deficient (taxonomic problems)	1	-																				
Rare	4	2																				
Total	10	7																				
Direct impacts:	<p>The main impacts expected are as follows:</p> <ul style="list-style-type: none"> Destruction of the <i>Passerina montana-Scleria transvaalensis</i> scrubveld. The current layout destroys the entire <i>Passerina montana -Scleria transvaalensis</i> scrubveld (Figure 20). The development layout blocks any ecological corridors on the escarpment in a southerly and northerly direction and provides no “stepping stones” through the development. The original design in 2013 was smaller and humbly positioned with options to conserve portions of <i>Passerina montana - Scleria transvaalensis</i> scrubveld on either side of the development, including movement corridors (compare Figures 19, 20 and 21). 																					

Biodiversity (vegetation) aspect	Result
	<ul style="list-style-type: none"> • Destruction of the <i>Aloe arborescens-Clivia caulescens</i> cliff edge vegetation and sensitive plant species. • Destruction of sensitive plant species on the vertical cliff (several threatened species can be impacted on). • Falling objects impacting on the sensitive vegetation along and below the cliff. • Damage to forest vegetation and sensitive species along the Prestressed Steel Tank pipeline and at the tank locality. • Introduction of alien invasive plant species to the area and lead to an increase of the invasive species already present.
Indirect impacts	<ul style="list-style-type: none"> • Change in hydrology: if the scrubveld is developed it will impact the water regime / available water for vegetation on the cliff's edge, on the cliff, as well as the forest below. • Overshadowing of the vegetation on the cliff face by the skywalk and skybridge. • These structures could also have a rain shadow effect, or concentrate runoff along the cliff face, destroying vegetation in crevices. • Falling objects impacting on the sensitive vegetation along and below the cliff (e.g. litter). • Introduction of alien invasive plant species to the area, either as planted ornamentals or via visitors. • Polluted water or piped water discharging into surrounding vegetation. • Modification of natural vegetation: the vegetation within the development footprint might be landscaped and irrigated (including the sue of species not naturally occurring in the area). This could change the species composition and abundance (or density) of the vegetation around the development footprint.
Cumulative impacts:	<ul style="list-style-type: none"> • Potential future expansion of the development • This will increase fragmentation within narrow patches of natural to near-natural vegetation. • Degradation of the vegetation around the development particularly from the cliff edge downwards. This will impact on the vegetation species composition and functionality. • Landscaping and irrigation of the vegetation within the development footprint could increase bird diversity, resulting in the establishment of plant species not naturally from the area.
Residual impacts:	<ul style="list-style-type: none"> • Species removed and relocated as part of rehabilitation could die due to transplantation shock or damage during replanting. • Degradation of vegetation along the vertical cliffs and the forests below. • Change in ecological processes. • Increase in alien invasive vegetation. • Unforeseen impacts.

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1. INTRODUCTION

Zutari (in conjunction with other partners) has been appointed for the management of the God's Window Skywalk project. A business ownership model for the project has been developed and a Public Private Partnership (PPP) agreement has been formed with Mapulana Canyon (Pty) Ltd for the design, finance, build, operate and transfer of the project.

Dimela Eco Consulting was appointed to assist with the vegetation assessment for the proposed development. A vegetation assessment, forming part of an Ecological Report, was undertaken for the site in the year 2013 by Strategic Environmental Focus (SEF, 2013). Dimela Eco Consulting was tasked to verify the existing vegetation report, to undertake a field survey and update the report to satisfy the requirements of the Protocols for terrestrial biodiversity (vegetation) assessment, as well as a terrestrial plant species assessment, as published in the Government Gazette No 43310 on 20 March 2020 and Government Gazette No 43855 on 30 October 2020 in terms of sections 24(5)(a) and 25 (5)(h) of NEMA.

The following is relevant to the Protocols as detailed by the National Web based Environmental Screening Tool downloaded on the 20/01/2022 08:15:45:

- The site is classified as 'very high terrestrial biodiversity sensitivity'
- The property is also classified as high with a smaller section of medium for sensitive plant species, indicating that the site includes confirmed localities of some plant species of conservation concern, as well as suitable habitat for others.

Therefore, a terrestrial vegetation assessment, as well as a terrestrial plant species assessment, as published in the Government Gazette No 43855 on 30 October 2020 in terms of sections 24(5)(a) and 25 (5)(h) of NEMA, should be undertaken.

The National Web based Environmental Screening Tool report indicates that confirmed localities for two (2) plant species of conservation concern are present on or close to the site, while suitable habitat for another twenty-nine (29) species are likely present (the medium sensitivity). In addition, the historical report undertaken in 2013, confirmed the occurrence of the two species, as well as an additional three (3) species of conservation concern.

This report thus undertook to:

- Verify the vegetation communities as recorded in 2013 and amend where needed.
- Verify the persistence and population size (where possible due to steep cliffs) of plant species of conservation concern that was historically recorded by the 2013 assessment.
- Habitat assessment and Timed-Meander Surveys to search for additional plant species of conservation concern for which suitable habitat is present.

1.1 Locality and background

The God's Window lies on land owned by the State. Development of this area is to allow the communities and residents of nearby areas to derive economic benefits from this portion of land. The God's Window Skywalk Project has been proposed, to be managed by a Consortium involving the local communities surrounding God's Window in partnership with the Mpumalanga Tourist and Parks Agency (MTPA) and other project developers. A business ownership model for the project has been developed and a Public Private Partnership (PPP) agreement has been formed with Mapulana Canyon (Pty) Ltd for the design, finance, build, operate and transfer of the God's Window Skywalk at the Blyde River Canyon Nature Reserve, Mpumalanga.

The study area is located at God's Window in the Mpumalanga Province approximately 7km north-east of Graskop and falls in Quarter Degree Grid (QDG) 2430DD. The R543 road forms the western boundary of the site (Figure 1). The assessed area entails about 10ha around current infrastructure at God's Window, including steep cliffs and inaccessible areas. About 5.5ha can be safely surveyed by foot, as well as the existing footpaths. The proposed development will encompass about 2.2ha of the 10ha footprint, of which at least 5.5 ha was assessed.

1.2 Terms of reference:

Complete a terrestrial plant assessment in line with the terrestrial biodiversity protocols, including

- Literature review including an existing ecological report of the site undertaken in the year 2013 (SEF, 2013).
- Review existing spatial data and vegetation information for the area and supply background information on the site relating to conservation plans and threatened ecosystems. These will include updated sources to what was available in 2013.
- Field survey to verify the vegetation results of the 2013 assessment and amend vegetation communities where needed.
- Walk the existing walkways to determine if any protected trees / plants could be impacted on or will need to be pruned as part of an upgrade to the walkways;
- Report and map describing the vegetation communities found / verified on the site and its conservation importance and function within the landscape;
- Map indicating confirmed or potential habitat for plant species that are of conservation concern as well as ecologically sensitive vegetation groupings; and
- Assessment and report on the impacts that the proposed development and related activities could have on the vegetation on site, as well as recommendations to limit or negate these perceived impacts.



Figure 1: Locality map. The development footprint and main area assessed are indicated in red

The terms of reference for a terrestrial plant species assessment report were as follows:

- Up to five plant species of conservation concern have been confirmed to be present historically. The persistence of these and its local population size (where possible due to accessibility) will be determined.
- In addition, the field survey will focus on the identified suitable habitat for the plant species of conservation concern that has a medium probability of occurring, as determined by the terrestrial vegetation assessment. The timed meander survey method is proposed (State of Queensland, 2014; SANBI, 2020).
- If more species are identified that could be mapped in the time frame proposed, a follow-up assessment will be proposed.

1.3 Assumptions and Limitations

The following limitations is applicable, although not considered fatal flaws to the study:

- Vegetation surveys must take place during the summer season (beginning of November to the end of April). Threatened species can be overlooked when not in flower and therefore studies should be conducted during the flowering season of all threatened plant species that may potentially occur. As the different plant species flower at different times during the growing season, a follow-up visit may be required where suitable habitat was observed for a specific species that was not in flower at that time. As the 2013 assessment was undertaken in October and November, it was recommended that this assessment take place during March, which is when additional species of conservation concern that may occur, will be flowering. However, it is possible that the species that flowers earlier in summer (Oct-Nov) will not be noted when not in flower, and therefore a follow-up assessment may be recommended.
- The cliff area was surveyed to where it is safe to do so without falling or damaging sensitive environments. No abseiling /rappelling was undertaken.
- Exceptionally good rains preceded the site visit. This resulted in dense vegetation and smaller, cryptic species could have been overlooked, particularly within forests and within the scrubveld.
- A thunderstorm and lightning halted the assessment in the late afternoon on the 1st of March. Both the 1st and 2nd off March were cloudy and misty.
- Heavy rain and thunder on 1 March interfered with the gps system and some points had to be deleted as they were recorded in localities outside of the project area of influence.
- The area burnt during a severe fire in 2018 and vegetation structure has seemingly changed since the 2013 report (Laevelder 12 September 2018). Also, effects of helicopter water drops were noted in that dead trees and *Aloe arborescens* trunks were flattened. This likely also resulted in the densification of species such as *Cliffortia* on this area.
- The activities and footprint for the upgrade of the footpaths were not known at the time of the site visit. It was understood that the upgrade may entail the replacement of paving and construction of hand railings.
- The specialist did not have access to the Blyderivierspoort Nature Reserve Management Plan.

2. METHODOLOGY

The assessment entailed a literature review as per this scoping report, a site survey and reporting. The methodology used is shortly summarised below.

2.1 Literature- and data review

The description of the regional vegetation relied on literature from Mucina & Rutherford (2006). Plant names follow applicable field guides such as Onderstall, (1996), Van Wyk & Van Wyk (1997), Van Wyk & Malan (1997), Pooley (1998), Henderson (2001), Van Oudtshoorn (2002), Schmidt et al (2002), McMurtry et al (2008) and Bromilow (2010). The study was undertaken in accordance with the Mpumalanga Minimum Requirements for Biodiversity Assessment (Mpumalanga Tourism and Parks Agency, 2008).

Data and literature consulted:

- The Mpumalanga Biodiversity Sector Plan (MBSP)
- The existing ecological report for the site undertaken in the year 2013 (SEF, 2013)
- Information on plant species recorded for the Quarter Degree Square (QDS) that the site is situated in was extracted from the Botanical Database of Southern Africa hosted by SANBI on the new Plants of Southern Africa website (<https://posa.sanbi.org>).
- Additional info was sourced from the Mpumalanga Tourism and Parks Agency (M. Lötter email communication, 28 February 2022)
- A short list of plant species of conservation concern was derived from the above and the Threatened Species Programme, Red List of South African Plants (Red List of South African plants version 2020(<http://redlist.sanbi.org/>)) and species listed within the national Screening Tool Report for the site, dated 20/01/2022 08:15:45.
- Threatened Ecosystem data was extracted from the 2018 Nasional Spatial Biodiversity Assessment (NSBA) (Skowno *et al*, 2019)
- Historical aerial imagery downloaded from Chief Directorate: National Geospatial Information Geospatial Portal (<http://www.cdngiportal.co.za/cdngiportal>).
- Citizen Science Website: iNaturalist.org

2.2 Project Area of Influence

The Project Area of Influence (PAOI) is defined as per the Species Environmental Assessment Guideline (SANBI, 2020) and was based on the development footprint and the potential extent of the impacts (e.g., edge effects) of the project activities. As proposed, the development will not destroy the entire area assessed. Thus, the proposed development footprint of the facilities was regarded as the primary PAOI. The Gods Window area was regarded as the secondary PAOI. Edge effects into a tertiary PAOI is likely, and include the cliff face and forest below, which could not be sampled (Figure 2). Some impacts may take place opposite of the R534 road, as the plantation areas could be used as construction camps. However, the locality of construction camps was not yet known, and the area was not assessed.



Figure 2: Project area of influence

2.3 Field survey

2.3.1 Timing and intensity

- The site visit was undertaken from the 1st to the 3rd of March 2022. A sampling and track map of the main transects is given in Figure 3 (larger image attached in Appendix A).
- At least 6.13km was walked over a 10-hour period (Table 1).
- Sampling was undertaken within the proposed development footprint, as well as the larger 10ha site to where it was safe to do so (excluding cliff faces and forests below).

Table 1: Main sampling tracks and sampling duration

Date	Track	Length	Duration
1 March	Track 1	630m	0h: 24m
	Track 2	1.2km	2h:14m
2 March	Track 1	900m	1h:46m
	Track 2	1.7km	3h:48m
3 March	Track 1	450m	1h: 14m
	Track 2	1.25km	1h:11m
Total		6.13km	10h: 6m

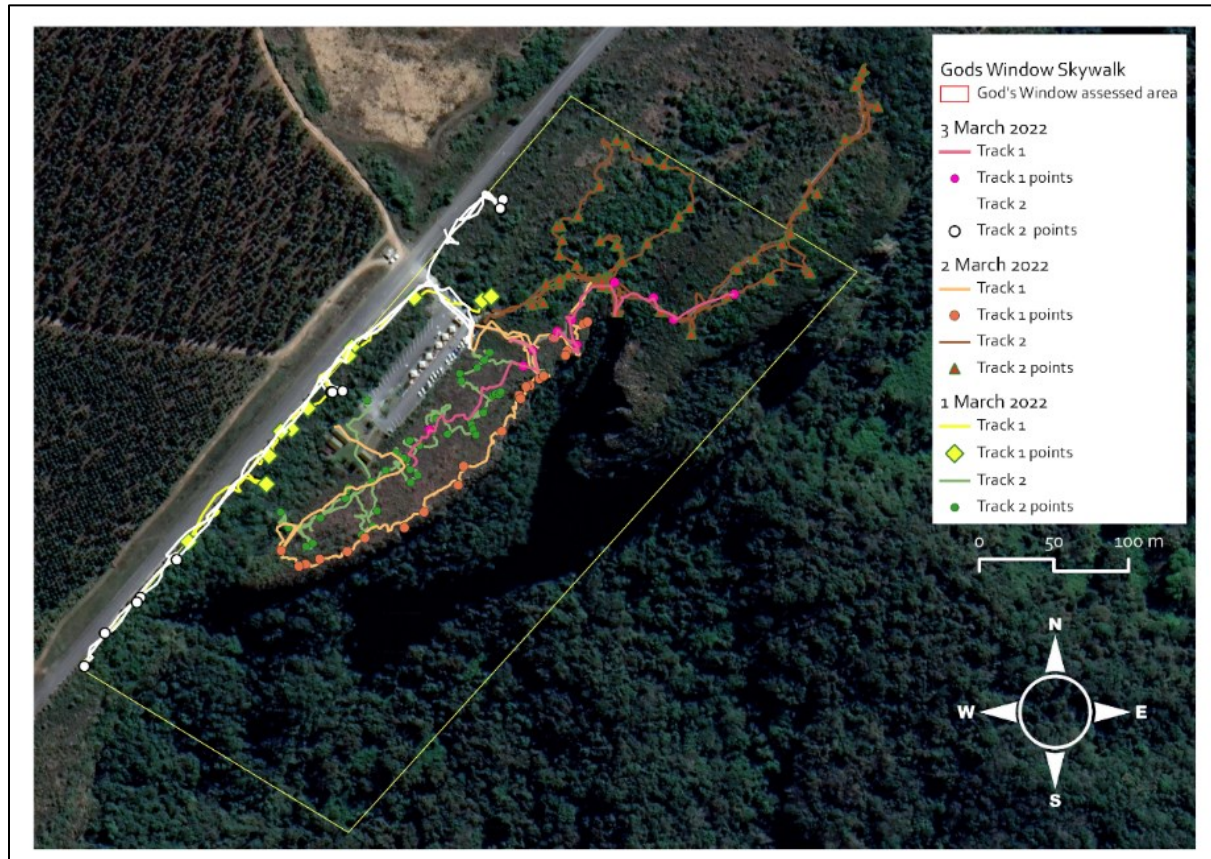


Figure 3: Tracks and sampling points

2.3.2 Method

Prior to the site visit, the vegetation was delineated into homogenous units along the route alignments and on the plant site, using currently available Google Earth imagery. Large areas along the proposed routes were found to have been cultivated in the past or modified by disturbances. The field survey focussed on identifying natural and untransformed vegetation, unique features that could indicate local sensitivities such as threatened and protected plants, as well as sensitive ecological features such as wetlands, ridges and rivers that are essential for the maintenance of ecosystems and ecological processes. At several sites within each homogeneous unit, a survey of total visible floristic composition was undertaken. Where access was allowed, random transects were walked. Plant identification and vegetation description relied on species recorded in the sampling points along the walked transects.

2.4 Mapping

Mapping was done by comparing georeferenced ground survey data to the visual inspection of available Google-Earth Imagery and in that way extrapolating survey reference points to the entire study area. Delineations are therefore approximate, and due to the intricate mosaics and often gradual mergers of vegetation associations, generalisations had to be made. Mapped associations thus show where a certain

vegetation unit is predominant, but smaller inclusions of another vegetation association in this area do exist but have not been mapped separately.

2.5 Site Ecological Importance (sensitivity)

The Site Ecological Importance in terms of vegetation is discussed and mapped as per the requirements of the Species Environmental Assessment Guideline (SANBI, 2020). The assessment criteria and matrices are detailed in Table 2, Table 3, and Table 4.

SEI is considered to be a function of the Biodiversity Importance (BI) of the receptor (e.g. species of conservation concern, the vegetation/fauna community or habitat type present on the site¹³) and its 679 resilience to impacts (Receptor Resilience) as follows:

$$SEI = BI + RR$$

BI in turn is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows:

$$BI = CI + FI$$

Conservation Importance (CI) is evaluated in accordance with recognised established internationally acceptable principles and criteria for the determination of biodiversity-related value, including the IUCN Red List of Species, Red List of Ecosystems and Key Biodiversity Areas (KBA; IUCN (2016)).

Table 2: Criteria for assessing CI, FI and RR

Classification	Conservation Importance	Functional Integrity	Receptor Resilience
Very high	<ul style="list-style-type: none"> Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global Extent of Occurrence of < 10 km² Any area of natural habitat of a CR ecosystem type or large area (> 0.1 % of the total ecosystem type extent) of natural habitat of an EN ecosystem type 	<ul style="list-style-type: none"> Very large (>100 ha) intact area for any conservation status of ecosystem type or >5 ha for CR ecosystem types High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing) 	<ul style="list-style-type: none"> Habitat can recover rapidly (<5 years for >70% of the original species composition and functionality). Species very highly likely to remain at a site during impact. Species very highly likely to return once the impact ceases.
High	<ul style="list-style-type: none"> Confirmed or highly likely CR, EN, VU species. IUCN threatened species must be listed under any 	<ul style="list-style-type: none"> Large (>20 ha but <100 ha) intact area for any conservation status of 	<ul style="list-style-type: none"> Habitat can recover relatively quickly (5-10 years for >70% of the original species

Classification	Conservation Importance	Functional Integrity	Receptor Resilience
	<p>criterion other than A, include if there are less than 10 locations or < 10 000 mature individuals remaining.</p> <ul style="list-style-type: none"> • Small area (>0.01% but < 0.1 % of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1 %) of natural habitat of VU ecosystem type. • Presence of Rare species. 	<p>ecosystem type or >10 ha for EN ecosystem types.</p> <ul style="list-style-type: none"> • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches • Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential 	<p>composition and functionality.</p> <ul style="list-style-type: none"> • Species highly likely to remain at a site during impact. • Species highly likely to return to site once impact ceases.
Medium	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under A criterion only and which have more than 10 locations or more than 10 000 mature individuals. • Any area of natural habitat of threatened ecosystem type with status of VU • Presence of range-restricted species • More than 50 % of receptor contains natural habitat with potential to support SCC 	<ul style="list-style-type: none"> • Medium (>5 ha but <20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types • Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches • Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance; moderate rehabilitation potential 	<ul style="list-style-type: none"> • Recovers slowly (>10 years for >70 % of the original species composition and functionality • Species moderately likely to remain at site during impact. • Species moderately likely to return to site once impact ceases.
Low	<ul style="list-style-type: none"> • No confirmed or highly likely SCC. • No confirmed or highly likely range-restricted species. 	<ul style="list-style-type: none"> • Small (1 – 5ha) area. • Almost no connectivity but migration still possible across transformed / degraded habitat; very 	<ul style="list-style-type: none"> • Unlikely to recover fully (<50% restored) after >15 years. • Species have low likelihood of remaining at site during the impact.

Classification	Conservation Importance	Functional Integrity	Receptor Resilience
	<ul style="list-style-type: none"> Less than 50 % contains natural habitat with limited potential to support SCC. 	busy surrounds. Low rehabilitation potential. <ul style="list-style-type: none"> Several minor and major ecological impacts. 	<ul style="list-style-type: none"> Species have low likelihood of returning to site once impact ceases.
Very low	<ul style="list-style-type: none"> No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining. 	<ul style="list-style-type: none"> Very small (<1 ha) area. No connectivity except for flying species. Several major current ecological impacts. 	<ul style="list-style-type: none"> Unable to recover from major impacts. Species unlikely to remain at site during the impact. Species unlikely to return once impact ceases.

Table 3: Matrix for determining BI

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very High	High	Medium	Low	Very Low
Functional Integrity (FI)	Very High	Very High	High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

Table 4: Matrix for determining SEI

Site Ecological Importance (SEI) (Mitigation)		Biodiversity Importance (BI)				
		Very High	High	Medium	Low	Very Low
Receptor Resilience (RR)	Very Low	Very High (Avoid)	Very High (Avoid)	High (Avoid & Minimise)	Medium (Minimise & Restore)	Low (Minimise & Restore)
	Low	Very High (Avoid)	Very High (Avoid)	High (Avoid & Minimise)	Medium (Minimise & Restore)	Very Low (Minimise)
	Medium	Very High (Avoid)	High (Avoid & Minimise)	Medium (Minimise & Restore)	Low (Minimise & Restore)	Very Low (Minimise)
	High	High (Avoid & Minimise)	Medium (Minimise & Restore)	Low (Minimise & Restore)	Very Low (Minimise)	Very Low (Minimise)
	Very High	Medium (Minimise & Restore)	Low (Minimise & Restore)	Very Low (Minimise)	Very Low (Minimise)	Very Low (Minimise)

The interpretation of the SEI ranks is described in Table 4 below. This table is a supplemented version of that which appears in the Species Environmental Assessment Guideline (SANBI, 2020). The SEI rating was utilised to generate the vegetation sensitivity map. This plan must be considered along with the fauna sensitivity map and wetland map to obtain an overall sensitivity map.

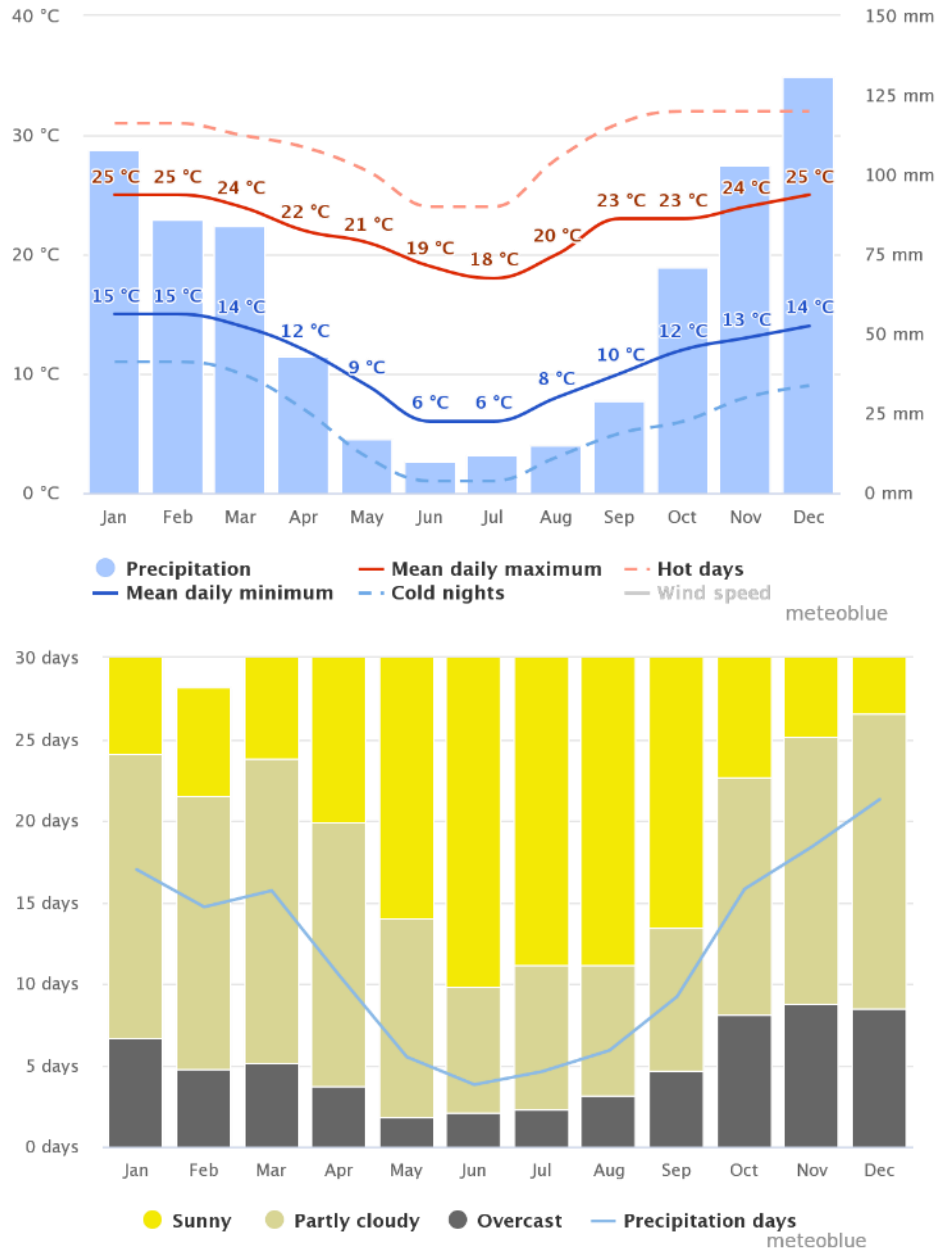
Table 5: Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities.

SEI	Interpretation in relation to proposed development activities (SANBI, 2020), with <i>mitigation added by the specialist</i>
Very High	<p>Avoidance mitigation - No destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages. Destructive impacts for species/ecosystems where persistence target remains.</p> <ul style="list-style-type: none"> • <i>Development within these areas is not supported.</i> • <i>Impacts are difficult to mitigate, if at all</i> • <i>Such features usually protected by legislation or guiding policies</i>
High	<p>Avoidance mitigation wherever possible. Minimization mitigation – Changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.</p> <ul style="list-style-type: none"> • <i>Development within these areas is undesirable and impacts are difficult to mitigate, if at all.</i> • <i>Impacts must be avoided or managed by an ecological management plan</i>
Medium	<p>Minimization & restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities</p> <ul style="list-style-type: none"> • <i>Development within these areas could proceed, limiting impact to sensitive vegetation, provided that appropriate mitigation measures are taken.</i> • <i>High impact developments should be considered with caution, if at all. Development must be restricted in footprint and impacts managed and mitigated by an approved management plan. Edge effects to higher sensitivity classes in its proximity must be mitigated / prevented.</i>
Low	<p>Minimization & restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities</p> <ul style="list-style-type: none"> • <i>Developable areas that are connected to sensitive features.</i> • <i>Edge effects must be prevented.</i>
Very Low	<p>Minimization mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required</p> <ul style="list-style-type: none"> • <i>Most types of development can proceed within these areas with little to no impact on conservation worthy vegetation.</i> • <i>Edge effects to other proximate sensitivity classes must be mitigated / prevented.</i>

3. BACKGROUND TO THE STUDY SITE

3.1 Climate

The project falls within the summer rainfall area, with warm summers and cool winters. Summer rainfall usually exceeds 1 400 mm per annum, augmented by mist during large parts of the year (Mucina and Rutherford, 2006). The graphs below show the annual average temperatures and precipitation for the Graskop area. Most rain falls during December, which is also the warmest month. Mist is common and days are mostly partly cloudy during summer.



Graph 1: Average temperature and precipitation for the area (top) and cloudy days (below) (meteoblue.com)

3.3 Topography and Hydrology

The proposed skywalk project is situated at an average elevation of about 1650m. the northern area of the assessed footprint reaches 1680m. the cliff drop to the valley in the southeast at about 1460m. The landscape is rugged, with steep east-facing cliffs. This escarpment is intersected in some areas with large east-flowing rivers. As per existing spatial layers, a non-perennial stream drains from the highest point towards the valley below (Figure 4).

3.4 Geology and soils

The landscape within the proposed footprint is very rocky and occurs on weather-resistant quartzite (Mucina and Rutherford, 2006). Quartzite is predominantly of the Black Reef Formation and the Wolkberg Group but also on the westerly Timeball Hill Formation and other quartzitic formations of the Pretoria Group (Transvaal Supergroup) (Mucina and Rutherford, 2006).

3.4 Overview of the regional vegetation types

The study area is situated within two Biomes, namely the Forests Biome and the Grassland Biome. The Forest Biome is defined as multi-layered vegetation which is dominated by trees with overlapping crown cover and the graminoids in the herbaceous layer are generally rare (Mucina & Rutherford, 2006). These forests are limited to regions with high water availability and persist in areas with mean annual rainfall of more than 725mm per annum during summer. The Grassland Biome is characterized by high summer rainfall and dry winters. Frost and fires during the winter, as well as marked diurnal temperature variations is unfavourable for tree growth resulting in the Grassland Biome consisting mainly of grasses and plants with perennial underground storage organs, such as bulbs and tubers. Many Rare and Threatened plant species are restricted to high-rainfall grassland, making this the vegetation type in most urgent need of conservation. Biomes can further be divided into smaller units known as vegetation types. According to Mucina and Rutherford (2006), three vegetation types occur within the area assessed namely: Northern Mistbelt Forest, Northern Escarpment Afromontane Fynbos and Northern Escarpment Quartzite Sourveld (Figure 5).

Northern Mistbelt Forest consists of tall, evergreen afrotemperate mistbelt forests on east facing cliffs and sheltered kloofs. The most common canopy trees include *Xymalos monospora*, *Podocarpus latifolius*, *Combretum kraussii*, *Cryptocarya transvaalensis* and *Pterocelastrus galpinii*. The understory consists of species such as *Psycotria zombamontana*, *Canthium kuntzeanum*, *Gymnosporia harveyana*, *Peddiea africana*, *Mackaya bella* and *Sclerochiton harveyanus*. Northern Mistbelt Forest is classified as Least threatened with about 10% statutorily conserved in the Blyde River Canyon, Lekgalameetse, Songimvelo, Barberton and Starvation Creek Nature Reserves (Mucina and Rutherford, 2006).

Northern Escarpment Afromontane Fynbos comprises shrubland which consists of sclerophyllous shrubs and herbs. Important taxa include small trees such as *Protea caffra*, *P. roupelliae*, succulent species such as *Aloe arborescens* and herbaceous species such as *Erica natalitia*, *Hypericum revolutum*, *Passerina montana*, *Cliffortia linearifolia*, *Erica revoluta*, *Erica simii*, *Euryops pedunculatus* and various *Helichrysum* species. This vegetation was classified as Least Threatened with more than 56% of this vegetation type protected (Mucina and Rutherford, 2006).

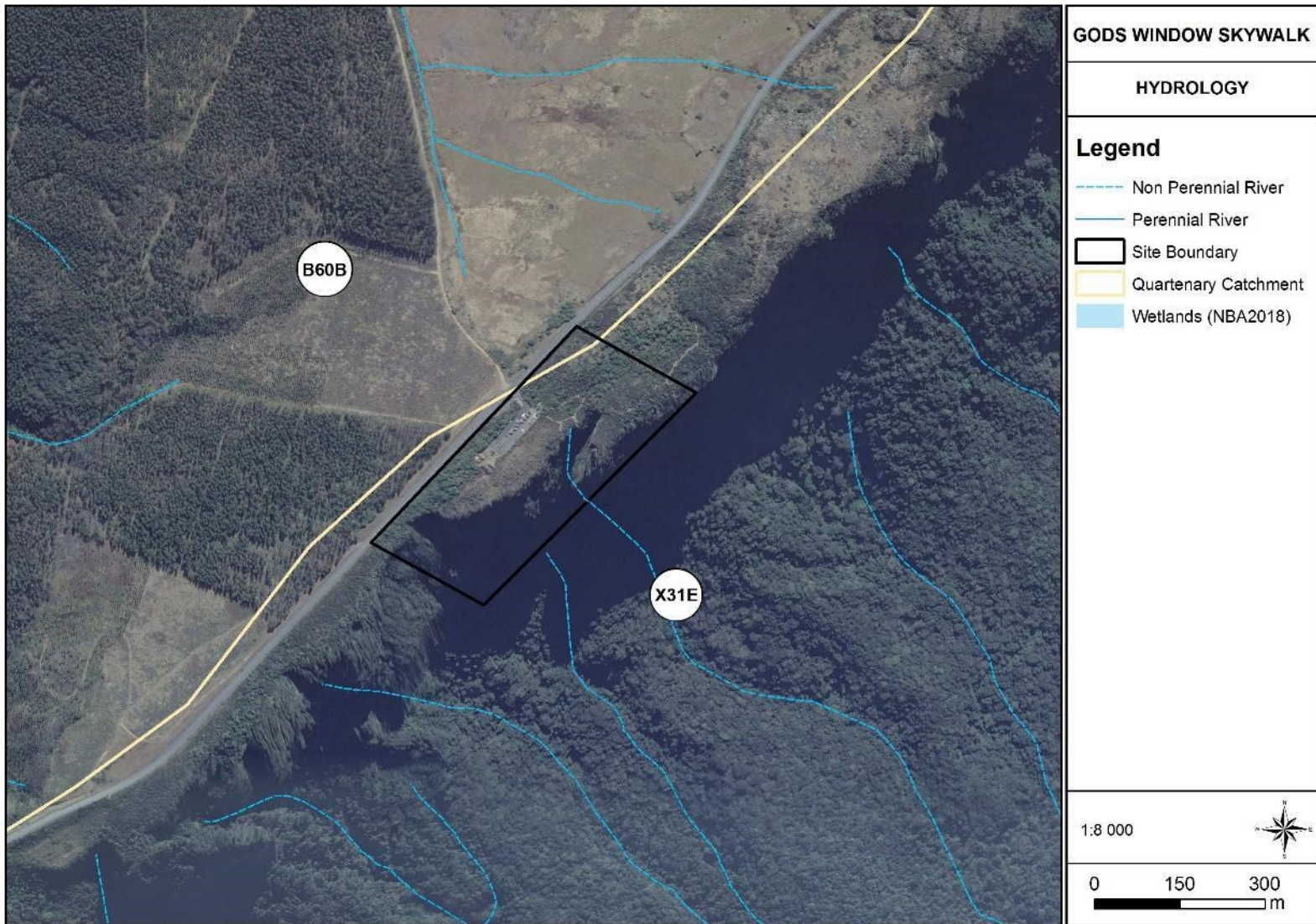


Figure 4: Hydrology of the area that the site is situated in

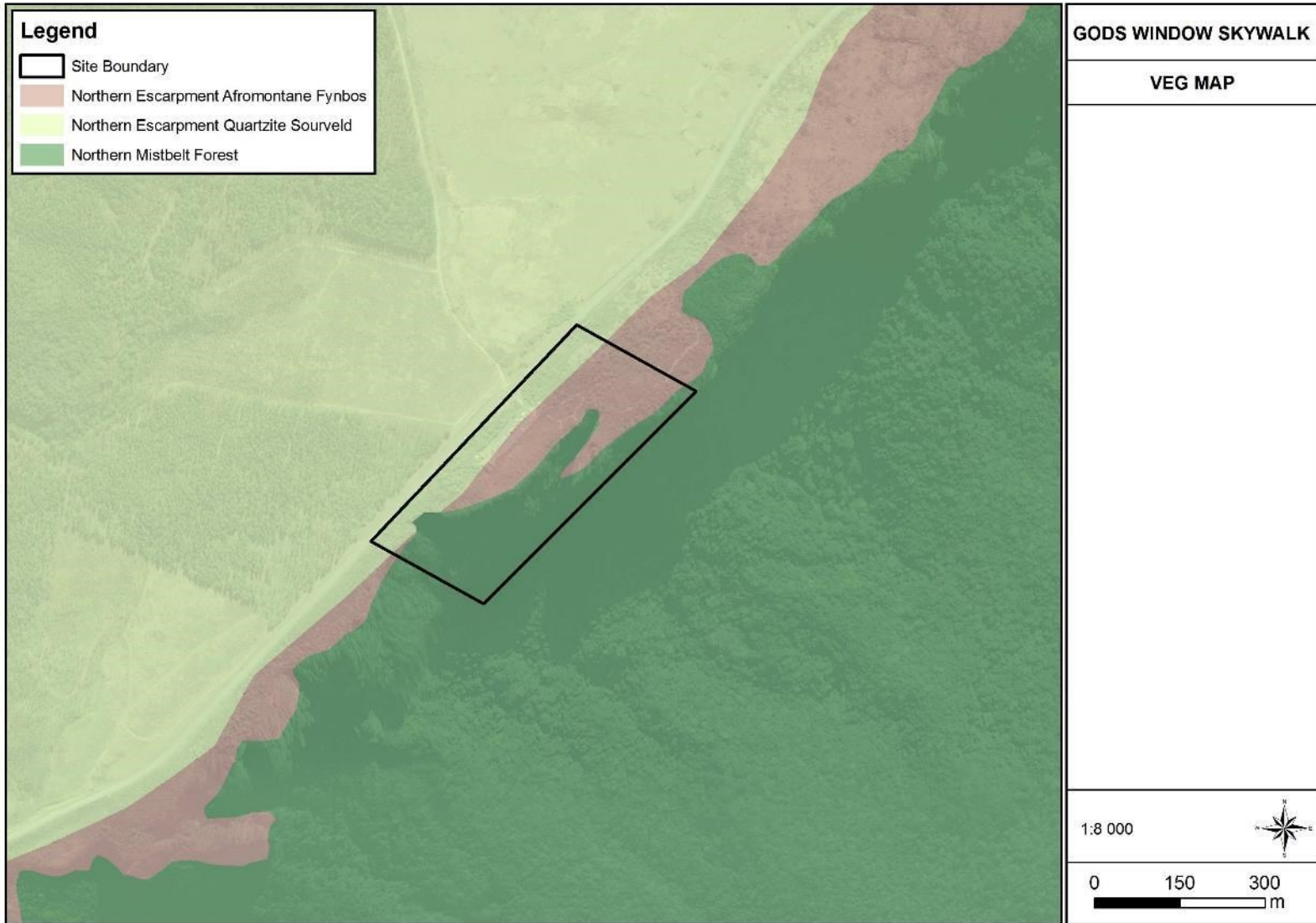


Figure 5: Regional vegetation map

Northern Escarpment Quartzite Sourveld occurs along the high-altitude crests of the Northern Escarpment. The landscape is characteristically very rugged with steep east-facing cliffs which are dominated by species such as *Protea roupelliae*, *Faurea galpinii*, *Faurea rochetiana*, *Syzygium cordatum*, *Alsophila dregei*, *Vernonia myriantha*. Low shrub species includes *Athrixia phyllicoides*, *Clutia monticola*, *Crotalaria doidgeae*, *Erica woodii*, *Euryops pedunculatus*, *Aloe arborescens*, *Crassula sarcocaulis* while the diverse herbaceous layer consists of species such as *Berkheya echinacea*, *Dicoma anomala*, *Eriosema angustifolium*, *Gerbera ambigua*, *Monsonia attenuata* and *Pearsonia sessilifolia*. Northern Escarpment Quartzite Sourveld is classified as Vulnerable with more than 38% transformed mainly by plantations (Mucina and Rutherford, 2006).

3.5 Listed Ecosystems

The National Environmental Management: Biodiversity Act (Act 10 of 2004) provides for listing threatened or protected ecosystems in one of four categories: critically endangered (CR), endangered (EN), Vulnerable (VU) or Protected (Section 52(1)(a) of the National Environmental Management: Biodiversity Act (Government Gazette 34809, Government Notice 1002, 9 December 2011). Ecosystem status is based on the percentage of original area remaining untransformed (by croplands, mining, urban development & roads) in relation to the biodiversity target and a threshold for ecosystem functioning. Biodiversity target refers to the percentage of the original areas required to capture 75% of the species occurring in each vegetation type. The targets are aimed only at species conservation, and ecological processes are not considered. No significant disruption of ecosystem functioning is assumed in least threatened vegetation units, which still have more than 80% of their original extent untransformed (Anderson, 2010).

According to the 2011 Listed Ecosystems, Gods Window falls within the Endangered Blyde Quartzite Grasslands (Figure 6) (Government Gazette 34809, Government Notice 1002, and 9 December 2011). Although the National List of Threatened Terrestrial Ecosystems published in terms of the Biodiversity Act in 2011 remains in legal force, the data contained in the recent National Biodiversity Assessment (NBA) 2018 represents an update of the assessment of threat status for terrestrial ecosystems, but the National List of Threatened Terrestrial Ecosystems has not yet been revised and therefore the gazetted 2011 Listed Ecosystems is still in force. Ecosystems such as the Blyde Quartzite Grassland were classified as "special" ecosystems under Criteria F of the South African classification systems in 2011. These ecosystems are now part of provincial Critical Biodiversity Area networks and are more appropriately highlighted.

The updated threatened ecosystems as per the recent NBA (2018) are listed along with its protection and threat status in Table 6 below and are geographically represented in Figure 7 (Skowno *et al*, 2019).

Table 6: The National Biodiversity Assessment's (NBA) threat status and protection level of ecosystem within and around the site (Skowno *et al*, 2019)

Ecosystem	Threat Status	Protection Level
Northern Mistbelt Forest	Least Concern	Well protected
Northern Escarpment Afromontane Fynbos	Least Concern	Well protected
Northern Escarpment Quartzite Sourveld	Least Concern	Moderately protected

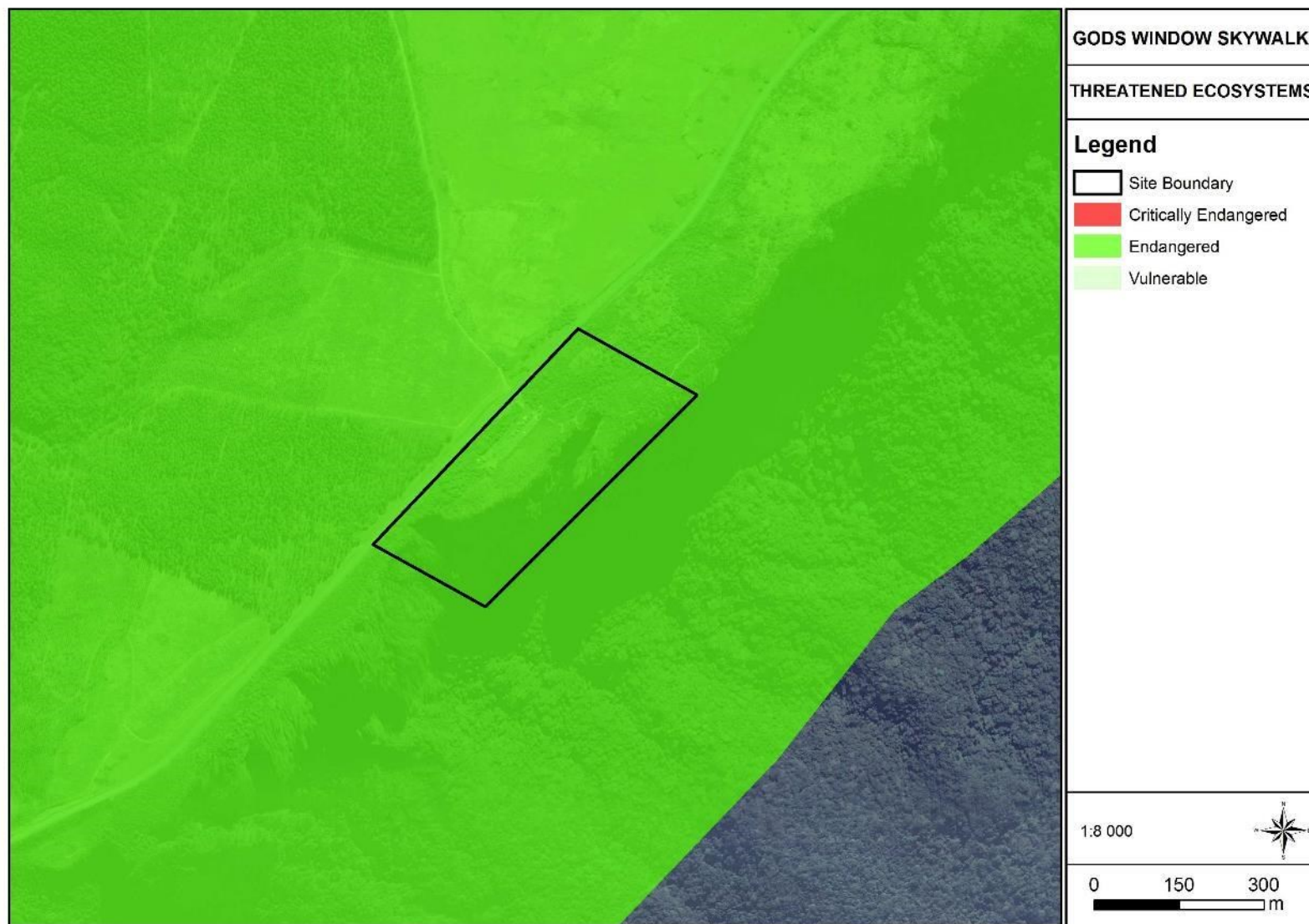


Figure 6: Threat status of the Blyde Quartzite Grassland as per the 2011 Listed Ecosystems

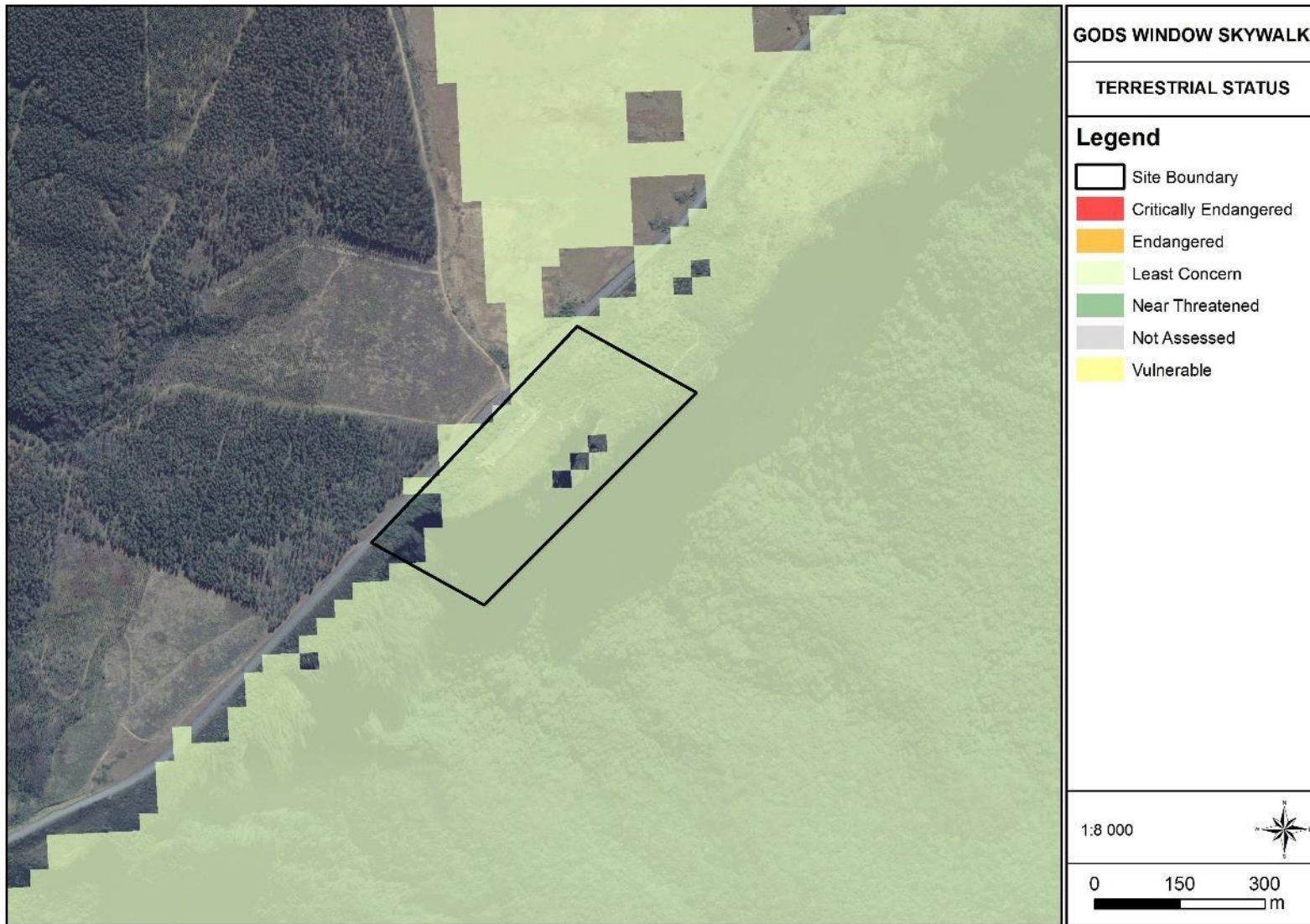


Figure 7: Terrestrial ecosystem status as per the recent National Biodiversity Assessment (Skowno et al, 2019)

3.6 Protected Areas

God's Window falls within the Blyderivierspoort Nature Reserve, which forms part of the larger Kruger to Canyon Biosphere Reserve (Figure 8). The Blyde Forest Nature Reserve is situated to the north of the site.



Figure 8: Protected areas map

3.7 Mpumalanga Biodiversity Sector Plan

The Mpumalanga Biodiversity Sector Plan (MBSP) delineates the following categories: Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), Other Natural Areas (ONAs), Protected Areas (PAs), and Modified Area (areas that have been irreversibly modified from their natural state). The map is a fine-scale map (1:10 000 - 1:25 000) that aims to guide sustainable development by providing a map of biodiversity priority areas that can be used by planners and decision-makers in a range of sectors.

The conservation categories present in the project area is geographically represented in Figure 9. Table 7 describes the conservation categories that are present on and around the site and tabulates the MBSP management goals for these categories.

Table 7: MBSP categories on and around the site

Conservation category	Management goals	Relevant section of the project (Figure 9)
Ecological Support Areas: Protected Area Buffer: Areas surrounding protected areas that moderate the impacts of undesirable land-uses that may affect the	These areas should be maintained in a functional, near-natural	<ul style="list-style-type: none"> • None • The plantation north-west of the

Conservation category	Management goals	Relevant section of the project (Figure 9)
ecological functioning or tourism potential of Protected Areas. Buffer distance varies according to reserve status: Nature Reserves — 5 km buffer; Protected Environments — 1 km buffer.	state, but some habitat loss is acceptable.	site forms part of this buffer area
Critical Biodiversity Areas (CBAs): Irreplaceable Most important biodiversity areas in the Province, outside of the protected area network. They represent the last remaining options for securing critical biodiversity and ecosystems and for achieving biodiversity targets. If these areas suffer any further loss of habitat or ecological function, it is likely that the biodiversity targets will not be met, and the status of species and ecosystems will decline.	Maintaining the natural vegetation cover of CBAs in a healthy ecological state	<ul style="list-style-type: none"> • None • Open space to the north of the site
Protected Area: Areas that are proclaimed as protected areas under national or provincial legislation, including gazetted Protected Environments. These areas meet biodiversity targets and therefore must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.	The Protected Areas Act (Act 57 of 2003) requires that land-use and management in each protected area is governed by a formally approved management plan.	<ul style="list-style-type: none"> • Entire proposed development

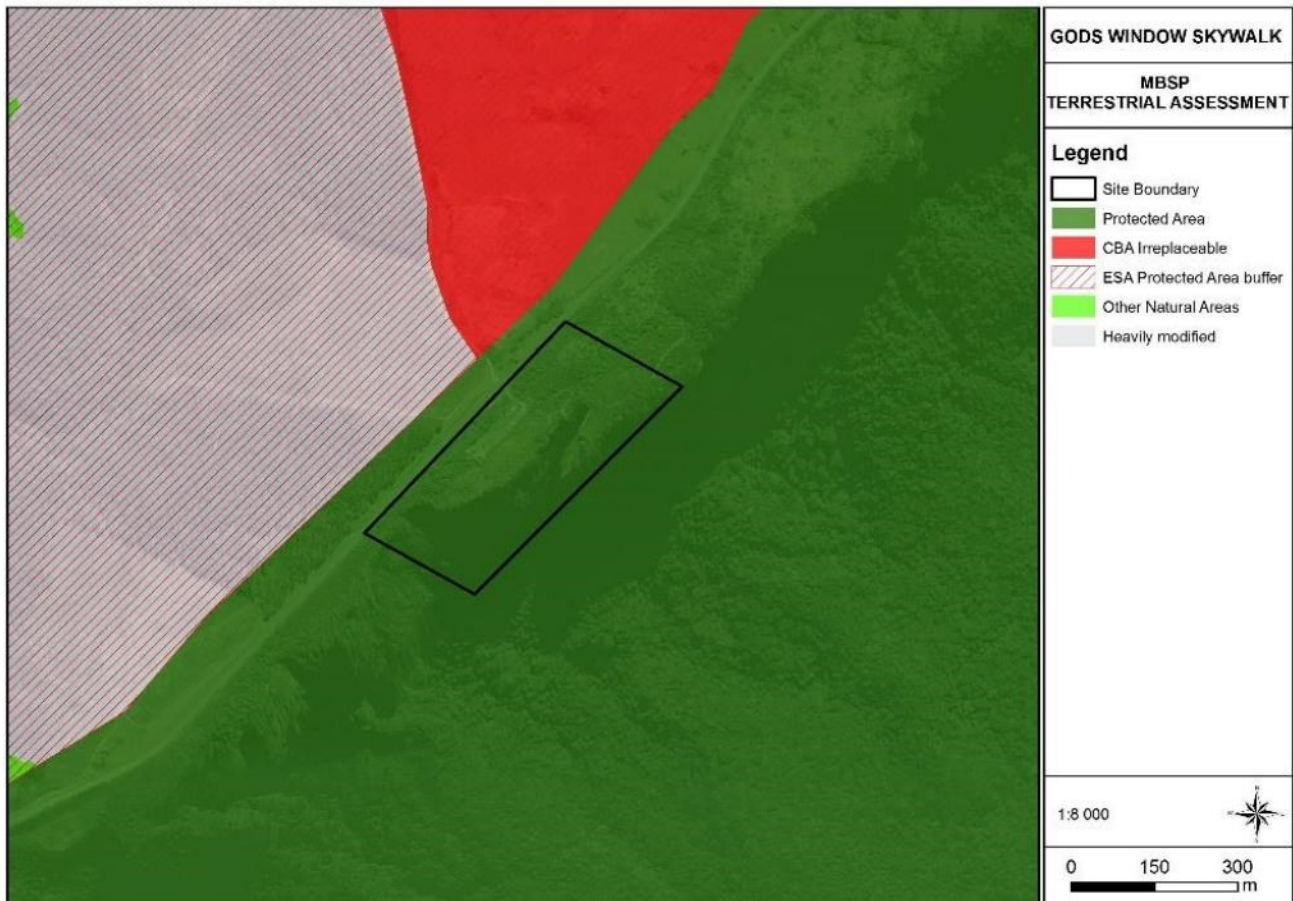


Figure 9: Mpumalanga Biodiversity Sector Plan Map

3.9 Ecological drivers and processes on the site

Frost, fire, and grazing maintain the herbaceous grass and forb layer and prevent the establishment of thickets or encroachment by trees into grasslands and scrubveld (Tainton, 1999). Fire is a natural disturbance caused by lightning, and regular burning is therefore essential for maintaining the structure and biodiversity of grasslands. Grassland plants are adapted to survive fires. If fire is prevented or frost becomes limited due to climate change factors, the vegetation structure degrades, and alien species could eventually dominate the natural vegetation. This will also lead to a decrease in species diversity as species adapted to fire and grazing will eventually decrease or die-off. Mismanagement of grasslands often leads to encroachment by non-herbaceous or 'woody' species. One such species – Bracken fern (*Pteridium aquilinum*) – can rapidly establish in dense stands. This species was recorded in dense stands within the area classified as Northern Escarpment Afromontane Fynbos (SEF, 2013). At the time of this assessment, the bracken fern was less dense, however, other woody species such as *Cliffortia linearifolia* were dense in trampled and disturbed areas.

Forests consist of mostly evergreen trees that form a closed canopy, with layers of plants beneath the canopy. They grow in areas with high rainfall and no frost. Forests are moist and seldom burn. The ground layer is almost absent due to the dense shade. On the edges of the patches are distinctive communities, the so-called fringe and ecotonal communities, which can tolerate fire. Mammals and birds disperse seeds and maintain gap processes which allow succession within the forests - and the maintenance of gene flow - which requires allowing seed dispensers and pollinators to move along the corridors between forest patches (Mucina and Rutherford, 2006). Fragmentation of forests will impact negatively on its conservation.

As per the 2013 Ecological and 2014 Wetland assessment reports (SEF, 2014 and SEF, 2014), the hydrology of the area seems interconnected and important in terms of regulating different moisture regimes in different areas, many areas serving as habitat harbouring for species of conservation concern (depended on different moisture regimes). Lateral water movement through the proposed development footprint seems likely to be an important component of the geohydrology of the area. The lateral waterflows daylight at seeps on top of the escarpment within the development footprint, as well slightly lower down on the cliff faces as springs and seeps of varying sizes and different hydroperiods. It was recommended that a detailed wetland study is conducted to ensure that the construction of the Skywalk complex does not change the hydrology of the area leading to the drier conditions on the vertical cliffs which will result in numerous populations of species of conservation concern dying (SEF, 2014).

3.10 Strategic Water Source Areas (SWSA)

Strategic Water Source Areas (SWSAs) are landscapes where a relatively large volume of runoff produces water for the majority of South Africa. Strategic water source areas can be regarded as natural 'water factories', supporting growth and development needs that are often a far distance away. Deterioration of water quality and quantity in these areas can have a disproportionately large negative effect on the functioning of downstream ecosystems and the overall sustainability of growth and development in the regions they support (Nel *et al.*, 2013). According to Le Maitre *et al.* (2018), the project is in the Mpumalanga Drakensberg & Northern Lowveld Escarpment Groundwater SWSA. Only 2.63% of this strategic water source is currently protected. Gods Window forms part of a protected area and is thus important to conserve the Mpumalanga Drakensberg & Northern Lowveld Escarpment Groundwater SWSA.

4. RESULTS

4.1 Land use and land cover

Historical aerial imagery indicated that the vegetation within the development footprint was much less dense in the year 1935 (Figure 10). The vegetation seemingly comprised grassland and some Northern Escarpment Afromontane Fynbos. By the year 1974, the parking area and the forest patch to the north thereof is noticeable, as well as denser vegetation along the cliff edge. The plantation areas have increased.

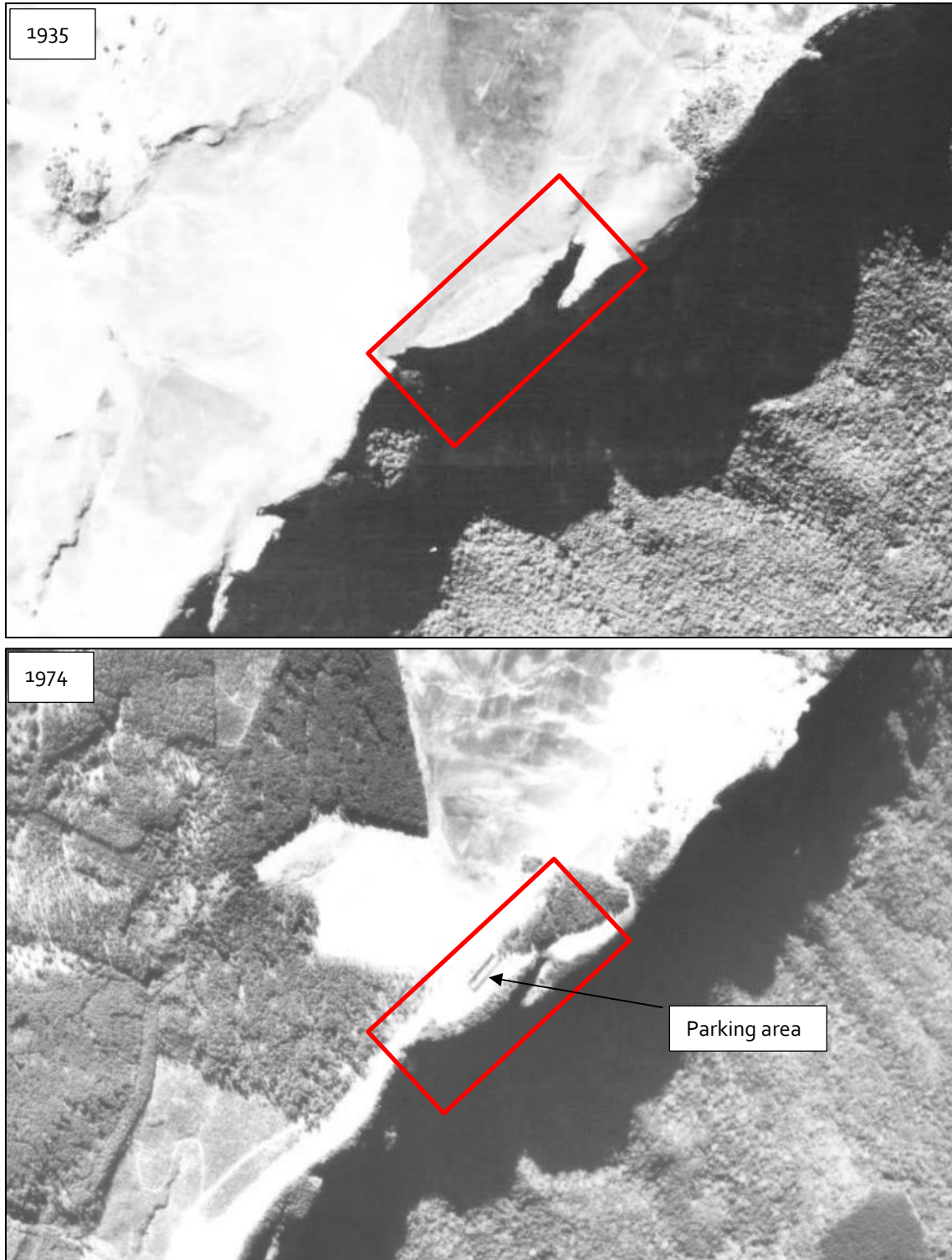


Figure 10: Aerial imagery dated 1935 (top) and 1974 (below) of Gods Window and surrounds (Chief Directorate National Geospatial Information Geospatial Portal)

In an image dated 1981, the R543 road to the north-west of the site is visible, as well as the increased plantation areas around the site and woody vegetation on the site (Figure 11). More recent satellite imagery of the year 2004 shows the densification of woody plants on and around the site (Figure 12).



Figure 11: Aerial imagery dated 1981 of Gods Window and surrounds (Chief Directorate National Geospatial Information Geospatial Portal)



Figure 12: Google Earth imagery of the site in the year 2004

Figure 13 shows a satellite imagery of the site in the year 2014 (23 March 2014), a few months after the 2013 vegetation assessment was undertaken by SEF (SEF, 2013). This image shows the dense stands of woody species to the east of the parking area as described by the SEF (2013) report at the time.



Figure 13: Google Earth satellite imagery of the year 2014

Recent satellite imagery of the year 2021, as well as the site visit, confirmed that the dense woody vegetation east of the parking area has been altered (Figure 14). MTPA personal at the entrance gate recalls a severe fire in the year 2018. This likely reduced the woody layer (particularly that of the Bracken fern (*Pteridium aquilinum*)) as described in the 2013 report (SEF, 2013).

Other than the parking area, associated infrastructure, and footpaths the site is undeveloped. The vegetation east of the parking area has been impacted on historically, including water drops by helicopters during fire, trampling along the edges, and historic test pits and filled in holes of unknown origin.



Figure 14: Google Earth satellite imagery of the site in 2022

4.2 Historical vegetation report findings (SEF, 2013)

4.2.1 Vegetation communities

The assessment undertaken in 2013 delineated four (4) vegetation types within the site as described below (SEF, 2013). No vegetation map was provided in the 2013 report. Thus, the extent of the vegetation communities at that time is not known.

1. Passerine montana/Pteridium aquilinum scrubveld

- This vegetation unit was recorded south (east) of the parking area.
- Some disturbances were recorded.
- Dominated by indigenous species such as *Passerine montana*, *Pteridium aquilinum*, (*bracken fern*) *Senecio coronatus* (woolly grassland Senecio), *Hypericum revolutum* (curry Bush), *Buddleja salviifolia* (sagewood) as well as smaller herbaceous species.
- Large populations of *Agapanthus inapertus* which are provincially protected, as well as *Drimia elata* which is listed as Declining.

2. Aloe arborescens/Clivia caulescens cliff edges

- Edges of the cliffs were dominated by large stands of *Aloe arborescens*.
- This was confirmed habitat for *Clivia caulescens*, listed as Near Threatened.

- Cliff edges were high in species diversity and supported more tree species than the adjacent *Passerina montana*/*Pteridium aquilinum* scrubveld, including *Podocarpus falcatus* which is nationally protected.

3. Vegetation on vertical cliffs

- Numerous rare, provincially protected and species of conservation concern were recorded on the cliff face, including one (1) Extremely Rare species, two (2) Vulnerable species, one (1) Rare and provincially protected species, and two (2) Near Threatened species.

4. Mistbelt forests

- Mistbelt forests were recorded directly below God's Window.
- Large tree species such as *Podocarpus falcatus*, (yellowwood), *Xymalos monospora* (lemonwood), *Cussonia spicata* (Cabbage Tree), *Schefflera umbellifera* (false cabbage tree) and *Psychotria capensis* (black bird berry) were recorded.
- The shrub layer consisted of *Obetia tenax* (nettle tree) as well as a diversity of ferns including *Alsophila (Cyathea) capensis* (tree fern) which was listed as Declining at the time (now Least Concern).

4.2.2 Protected and threatened plants

The 2013 report recorded numerous provincial protected plants, threatened species, as well as national protected tree species, as listed in the table below.

Table 8: Protected and threatened plant species as recorded in 2013 (SEF, 2013)

Legislation	Species
Provincially protected: Schedule 11 of the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998)	1. <i>Aloe aborescens</i> 2. <i>Aloe nubigena</i> 3. <i>Schizocarpus nervosus</i> 4. <i>Merwillia plumbea</i> 5. <i>Polystachya transvaalensis</i> 6. <i>Schizochilus lilacinus</i> 7. <i>Afrocarpus falcatus</i> 8. <i>Agapanthus inapertus</i> 9. <i>Clivia caulescens</i> 10. <i>Alsophila capensis</i> 11. <i>Faurea galpinii</i>
Threatened species / species of conservation concern: Plants that are Threatened, Extinct in the wild, Data deficient, Near-threatened, Critically rare, Rare in terms of Chapter 4, Part 2 of NEMA Biodiversity Act, 2004 (Act No. 10, 2004)	1. <i>Clivia caulescens</i> (Near threatened) 2. <i>Schizochilus lilacinus</i> (Extremely Rare) 3. <i>Monopsis kowynensis</i> (Vulnerable) 4. <i>Streptocarpus fenestra-dei</i> (Vulnerable) 5. <i>Drimia elata</i> (Data Deficient - Taxonomically Problematic) 6. <i>Merwillia plumbea</i> (Near threatened)
National protected tree:	1. <i>Podocarpus falcatus</i>

Legislation	Species
National Forests Act, 1998 (ACT NO 84 OF 1998), Notice 536, Government Gazette, 7 September 2018	

4.2.3 Ecological sensitivity as per the 2013 report (SEF, 2013)

The ecological sensitivity of the 2013 report is geographically represented in Figure 15 and shortly summarised below.

Very High Sensitivity:

The cliff edges and vertical cliffs were all classified to be of very high ecological sensitivity due populations of rare and threatened plant species as listed in Appendix C.

High Sensitivity:

The scrubland located between the current parking area and cliff edges were classified as high ecological sensitivity. Although these areas have been slightly disturbed, it was dominated by indigenous species. This area also plays a vital role in the hydrology of the area and any development on this area could adversely affect the hydrology on the cliffs possibly altering the sensitive system. Species relying on the moist conditions on the cliffs (including threatened and protected species) are highly likely to die should the cliffs dry out.

The mistbelt forest below the cliffs were also classified as highly sensitive due to the high species diversity associated with forests as well as the likelihood of various threatened faunal and floral species likely to be present.

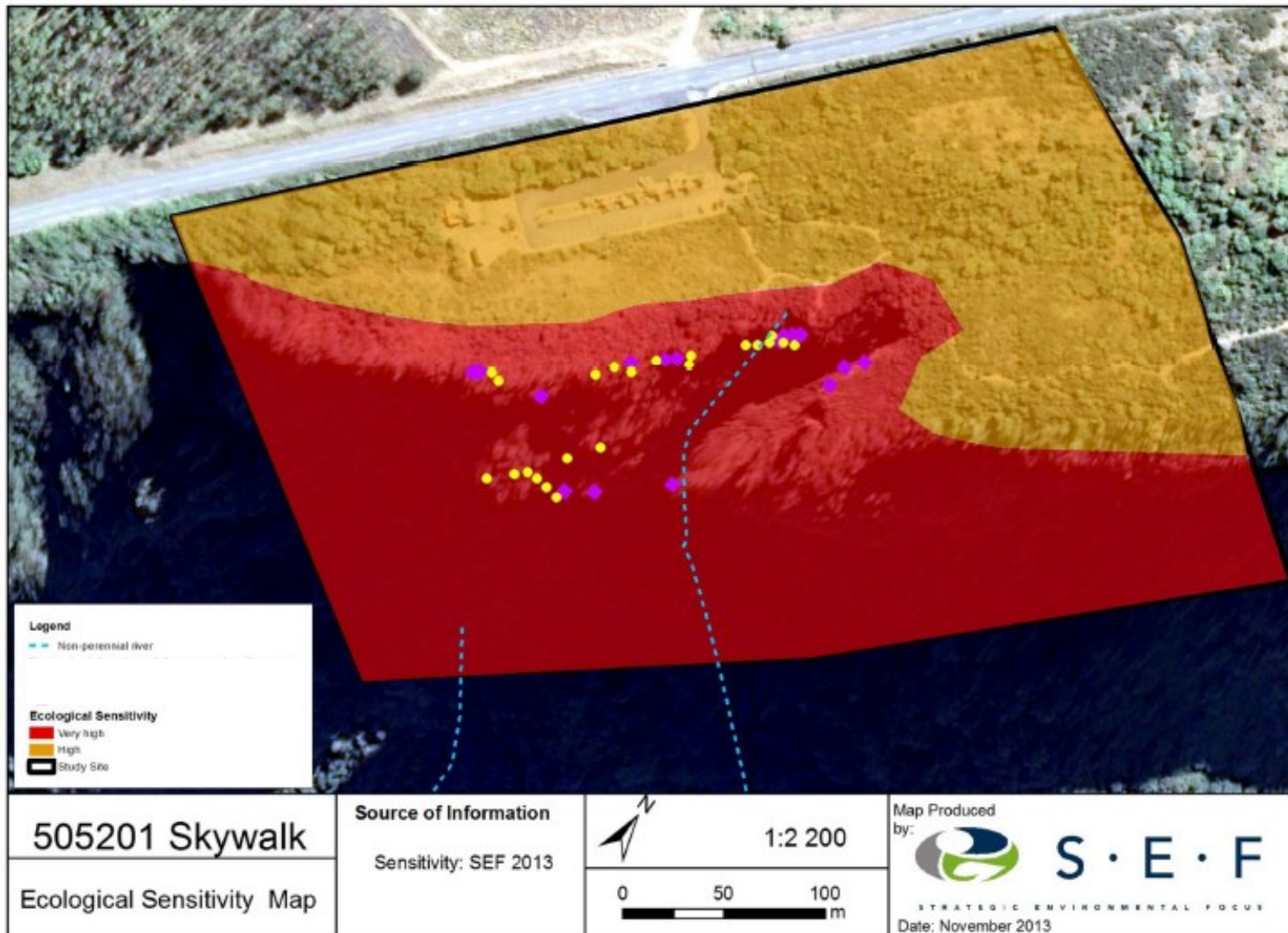


Figure 15: Historic ecological sensitivity map as per the ecological report undertaken by SEF in 2013 (SEF, 2013)

4.3 Broad vegetation groups delineated in 2022

During this assessment, the vegetation was found to be in a similar state as during the 2013 assessment (SEF, 2013). However, the structure and species dominance in the scrubveld have changed and several additional species were recorded throughout the vegetation groups. This assessment delineated four broad vegetation groups.

Each broad vegetation grouping is discussed below and geographically represented in Figure 16. Plant species that were recorded within each vegetation group at the time of the site visit is listed in a table below the vegetation group discussion and a comprehensive list is given in Appendix B.

1. *Passenaria montana*-*Scleria transvaalensis* scrubveld;
2. *Aloe arborescens*-*Clivia caulescens* cliff edges;
3. Vegetation on vertical cliffs; and
4. Mistbelt forests.

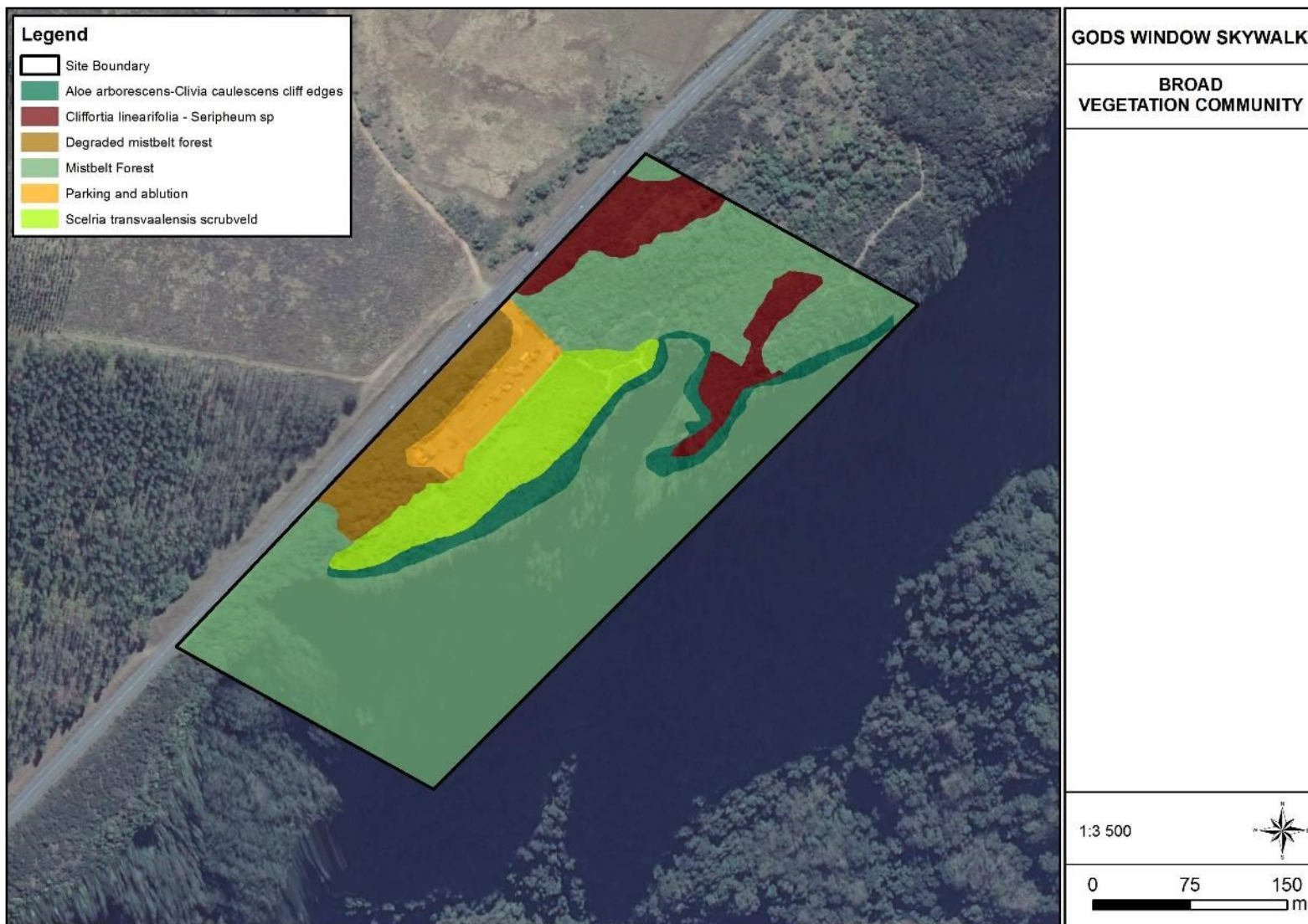


Figure 16: Vegetation map

4.3.1 Scrubveld

Scrubveld refers to vegetation that are typically dominated by shrubs, also including grasses, herbs, and geophytes. Shrubland may be the result of human activity or occur naturally. The scrubland on the site has species in common with the regional Northern Escarpment Afromontane Fynbos (Mucina and Rutherford, 2006) (see 3.4). Two subgroups were delineated as discussed below and mapped in Figure 16.

4.3.1.1 *Passerina montana* -*Scleria transvaalensis* scrubveld

The vegetation to the east of the existing parking area was delineated as *Passerina montana*-*Scleria transvaalensis* scrubveld. This area is proposed for the bulk of the skywalk projects infrastructure. At the time of this assessment, the sedge *Scleria transvaalensis* was dominant throughout this vegetation group (Photo plate 1 and 2). The shrub layer was dominated by several species with the most common being *Helichrysum wilmsii*, *Passerina montana* and *Tetraselago natalensis*. *Cliffortia linearifolia* (river rice-bush) formed dense stands along the edges of this vegetation with pathways and the parking area (Photo plate 1). The shrub *Seripheum* species A (Schmidt *et al*, 2002) was also common along pathways and the cliff area.



Photo plate 1: Dense stands *Scleria transvaalensis* and *Cliffortia linearifolia*



Photo plate 1: Burnt trees (left) and *Aloe arborescens* towards the cliff (right)

Dead trees, likely *Searsia tumulicola* dotted the vegetation. *Aloe arborescens* were recorded towards the cliff in the eastern section of the vegetation. While the edges of this vegetation group were densely vegetated by shrubs, the central area comprised open scrubveld with exposed rocky sheets, covered with the moss *Selaginella dregei* and succulents of the *Crassula* genus (Photo plate 3). Two (2) orchid species were recorded, as well as two additional provincially protected species (Table 9).



Photo plate 2: Open scrubveld with a patchy occurrence of *Passerina montana* and *Helichrysum* species.

Several forb species were observed (Table 9). Many of the forbs and geophytes were absent or obscured by dense vegetation in the 2013 assessment (SEF, 2013). The 2013 vegetation assessment described this vegetation community, south-east of the parking area, as *Passerina montana*/*Pteridium aquilinum* scrubveld, as it comprised dominant stands of the shrub *Passerina montana* shrub and a very dense layer of the fern *Pteridium aquilinum* (bracken fern) at that time (Photo plate 4). A fire during 2018 / 2019 has seemingly reduced the dominance of these species, however, *Pteridium aquilinum* (bracken fern) still forms dominant patches towards the most south-eastern portion of this vegetation community, whereas *Passerina montana* now forms part of a diverse shrub layer.



Photo plate 3: *Passerina montana*/*Pteridium aquilinum* scrubveld photographs copied from the SEF, 2013 report. Compare with Photo plate 1, 3 and 3

Table 9: Summary of the prominent and dominant species recorded within the open *Passerina montana*-*Scleria transvaalensis* scrubland (Appendix B)

Dominant taxa recorded
<u>Sedge:</u> <i>Scleria transvaalensis</i>
<u>Grasses:</u> <i>Cynodon dactylon</i> , <i>Pentstemon natalensis</i> , <i>Panicum ecklonii</i>
<u>Shrubs:</u> <i>Passerina montana</i> , <i>Helichrysum</i> species, <i>Cliffortia linearifolia</i> , <i>Buddleja salvifolia</i> , <i>Hypericum revolutum</i>
<u>Herbaceous plants:</u> <i>Tetraselago natalensis</i> , <i>Anisopappus smutsii</i> , <i>Sebaea sedoides</i> , <i>Coleus calycinus</i> , <i>Lobelia flaccida</i> , <i>Senecio coronatus</i> , <i>Commelina africana</i> , <i>Cyanotis lapidosa</i>
<u>Succulents:</u> <i>Aloe arborescens</i> , <i>Crassula pellucida</i> , <i>C. vaginata</i>
<u>Geophytes:</u> <i>Ledebouria</i> species, <i>Drimia elata</i> , <i>Agapanthus inapertus</i>
<u>Trees:</u> <i>Searsia tumulicola</i> , <i>Aeschynomene rehmannii</i>
<u>Ferns / mosses:</u> <i>Pteridium aquilinum</i> , <i>Pellaea calomelanos</i> , <i>Cheilanthes cf hirta</i> , <i>Sellaginella dregei</i>
Species richness (indigenous species) at the time of the site visits
<u>Grasses:</u> 6 <u>Forbs / small shrubs:</u> 33 <u>Trees:</u> 3 <u>Sedges:</u> 6 <u>Ferns/mosses:</u> 6
Protected or threatened plant species
Four provincially protected species were recorded here: <ul style="list-style-type: none"> • <i>Habenaria cf galpinii</i> • <i>Eulophia angloensis</i> • <i>Aloe arborescens</i> • The ferns <i>Pellaea</i> and <i>Cheilanthes</i> spp <p>One species classified as Data deficient, occurs at the edge of this vegetation unit and the <i>Aloe arborescens</i>-<i>Clivia caulenscens</i> cliff edge vegetation</p>
Alien and/or invasive plant species
<i>Lilium formasanum</i> , <i>Pinus patula</i> , <i>Solanum mauritianum</i>
Existing impacts
<ul style="list-style-type: none"> • Encroachment by the fern <i>Pteridium aquilinum</i>. • It seems the area was historically trampled. • Several holes, filled with rocks were noted closer to the cliff edge, likely historic test pits • A waste waterpipe from the bathrooms flood a portion of this vegetation to the south-west of the ablution facilities.

<ul style="list-style-type: none"> • Alien invasive plant species
Sensitive ecological features
<ul style="list-style-type: none"> • Groundwater recharge zones • Habitat to provincial protected species and likely threatened species, although not recorded at the time.

4.2.2.2 *Cliffortia linearifolia*-*Seripheum species A* scrubland at forest margins

The scrubveld to the north and north-east of the existing parking area were dominated by dense stands of the shrubs *Cliffortia linearifolia* and *Seripheum species A* (Schmidt *et al*, 2002) (Photo plate 5; Table 10). These areas included some forest trees, but mainly shrubs and small trees such as *Passerina montana*, *Tephrosia cf polystachya*, *Psoralea latifolia*, *Plectranthus rubrupuntatus*, *Hemizygia cf albiflora*, *Helichrysum species* and *Tetraselago natalensis*. *Scleria transvaalensis* was the dominant graminoid, along with *Pentaschistis natalensis* and *Setaria lindenbergia*.

Several ferns including *Dicranopteris linearis* and *Blechnum punctulatum* were noted. Both these portions of *Cliffortia linearifolia*-*Seripheum species A* scrubland included a worrying frequency of the invasives Pine, Wattle (*Acacia sp*) and *Solanum mauritianum* (bugweed). No plant species of conservation concern were recorded; however, the dense vegetation could have obscured cryptic species.

Table 10: Summary of the prominent and dominant species recorded within the dense *Cliffortia linearifolia*-*Seripheum species A* scrubland (Appendix B)

Dominant taxa recorded
<u>Sedge:</u> <i>Scleria transvaalensis</i>
<u>Grasses:</u> <i>Setaria lindenbergia</i> , <i>Pentaschistis natalensis</i> , <i>Panicum ecklonii</i>
<u>Shrubs:</u> <i>Seripheum species A</i> , <i>Cliffortia linearifolia</i> , <i>C serpyllifolia</i> , <i>Passerina montana</i> , <i>Buddleja salvifolia</i> , <i>Tephrosia polystachya</i> , <i>Psoralea latifolia</i>
<u>Herbaceous plants:</u> <i>Tetraselago natalensis</i> , <i>Helichrysum species</i> , <i>Hemizygia cf albiflora</i>
<u>Succulents:</u> -
<u>Geophytes:</u> <i>Agapanthus inapertus</i>
<u>Trees:</u> <i>Searsia tumulicola</i> , <i>Psychotria capensis</i> , <i>Cussonia spicata</i> , <i>Rapanea melanophloeos</i>
<u>Ferns / mosses:</u> <i>Blechnum punctulatum</i> , <i>Pentaschistis natalensis</i>
Species richness (indigenous species) at the time of the site visits
<u>Grasses:</u> 4 <u>Forbs / small shrubs:</u> 20 <u>Trees:</u> 6 <u>Sedges:</u> 4 <u>Ferns/mosses:</u> 4 <u>Climbers:</u> 2
Protected or threatened plant species
Several provincially protected ferns species occur in this vegetation group. The national protected tree <i>Podocarpus latifolius</i> was recorded, albeit limited in this vegetation
Alien and/or invasive plant species
<i>Lilium formasanum</i> , <i>Pinus patula</i> , <i>Solanum mauritianum</i> , <i>Acacia (wattle)</i>
Existing impacts
<ul style="list-style-type: none"> • Encroachment by the scrub into forest areas • Alien invasive plant species
Sensitive ecological features
<ul style="list-style-type: none"> • Groundwater recharge zones • Habitat to provincial protected species and likely threatened species, although not recorded at the time.



Photo plate 4: Dense stands of *Clifortia linearifolia* and *Seripheum* species A at forest margins

4.3.2 *Aloe arborescens-Clivia caulescens* cliff edge

This vegetation group agrees with the 2013 vegetation group *Aloe arborescens-Clivia caulescens*, although less dense, likely due to the 2018 /2019 fire. This vegetation forms a narrow band, and ecotone, between the *Passerina montana-Scleria transvaalensis* scrubland and the vertical cliff (Figure 16) and includes species from both the scrubland and forests below (Table 11).

The succulent *Aloe arborescens* was prominent and other trees along the cliff edge included *Cussonia spicata*, *Faurea galpinii* (escarpment Beechwood), *Searisa tumulicola*, *Rapanea melanophloeos* (Cape beach), *Myrsine*

africana, *Podocarpus latifolius* (real yellowwood) and *Greyia sutherlandii*. Two (2) geophytes of conservation concern were recorded here, *Clivia caulescens* (Near Threatened) and *Drimia elata* (Data Deficient) (Photo plate 6). The tree fern *Alsophila dregei* were noted. Dense stands of *Pteridium aquilinum* (bracken fern) were recorded towards the southern edge of this vegetation and stands of the sedge *Scleria transvaalensis* was the dominant groundcover along the edge (Photo plate 7).



Photo plate 5: *Aloe arborescens*-*Clivia caulescens* vegetation on the cliff edge including two geophytes of conservation concern (bottom right image)



Photo plate 6: Dense stands of *Pteridium aquilinum* and *Scleria transvaalensis* along the edge of the scrubland and *Aloe arborescens*-*Clivia caulescens* vegetation

Dominant herbaceous species included *Impatiens sylvicola*, *Coleus bojeri*, *Commelina africana* and *Sebaea sedoides*. The rare *Aloe nubigena* occurs on the edge of the cliff downwards.



Photo plate 7: Vegetation on the cliff edge

Table 11: Summary of the prominent and dominant species recorded within the *Aloe arborescens-Clivia caulescens* vegetation (Appendix B)

Dominant taxa recorded
<p><u>Sedge:</u> <i>Scleria transvaalensis</i> <u>Grasses:</u> <i>Setaria lindenbergia</i> <u>Shrubs:</u> <i>Passerina montana</i>, <i>Psoralea latifolia</i>, <i>Buddleja salvifolia</i>, <i>Hypericum revolutum</i> <u>Herbaceous plants:</u> <i>Coleus bojeri</i>, <i>Impatiens sylvicola</i>, <i>Sebaea sedoides</i>, <i>Lobelia flaccida</i>, <i>Senecio coronatus</i>, <i>Commelina africana</i> <u>Succulents:</u> <i>Aloe arborescens</i>, <i>Aloe nubigena</i> <u>Geophytes:</u> <i>Ledebouria</i> species, <i>Drimia cf elata</i>, <i>Agapanthus inapertus</i> <u>Trees:</u> <i>Cussonia spicata</i>, <i>Faurea galpinii</i>, <i>Searisa tumulicola</i>, <i>Rapanea melanophloeos</i>, <i>Podocarpus latifolius</i>, <i>Greyia sutherlandii</i>, <i>Myrsine africana</i> <u>Ferns / mosses:</u> <i>Alsophila dregei</i>, <i>Pteridium aquilinum</i>, <i>Dicranopteris linearis</i>, <i>Sellaginella dregei</i></p>
Species richness (indigenous species) at the time of the site visits – note that this area is partly inaccessible, and more species are likely present
<p><u>Grasses:</u> 1 <u>Forbs / small shrubs:</u>14 <u>Trees:</u> 7 <u>Sedges:</u> 1 <u>Ferns/mosses:</u> 6 <u>Climbers:</u> 1</p>
Protected or threatened plant species
<p>Five (5) provincially protected species were recorded here:</p> <ul style="list-style-type: none"> • <i>Aloe arborescens</i> and <i>A nubigena</i> • <i>Clivia caulescens</i> • <i>Alsophila dregei</i> (tree fern) • <i>Podocarpus latifolius</i> (yellow wood) <p>Three species are species of concern were recorded: 1 Near Threatened, 1 Rare and 1 Data deficient One national protected species were recorded, <i>Podocarpus latifolius</i></p>
Alien and/or invasive plant species
<p><i>Phytolacca octandra</i>, <i>Pinus patula</i>, <i>Solanum mauritianum</i></p>
Existing impacts
<ul style="list-style-type: none"> • Encroachment by the fern <i>Pteridium aquilinum</i>. • Alien invasive plant species particularly <i>Phytolacca octandra</i> and <i>Solanum mauritianum</i> have established on the edge of the cliff and will spread down to the forests.
Sensitive ecological features
<ul style="list-style-type: none"> • Highly sensitive vegetation with specific habitat requirements • Habitat to provincial protected species and threatened species.

4.3.3 Vegetation on vertical cliffs

The steep nature of the cliff was a limitation to survey the vegetation growing within the crevices and the vegetation was not directly sampled. This report relies on the data recorded in the 2013 assessment when that specialist was able to rappel down the cliff face (SEF, 2013). In addition, zoomed in photographs from various look-out areas were used to ascertain species composition where possible, as well as what could be seen from accessible slopes.

The vegetation on vertical cliffs is usually highly adapted to cope with temperature extremes and various moisture regimes (usually very wet or completely dry). Many species are also lithophytes and specially adapted to the growing conditions on the cliff face.

The 2013 assessment recorded numerous rare, provincially protected species, as well as species of conservation concern on the cliff face (SEF, 2013). The species and their updated threat status included *Schizochilus lilacinus* (Rare), *Monopsis kowynensis* (Vulnerable), *Aloe nubigena* (provincially protected), *Streptocarpus fenestra-dei* (Vulnerable), *Clivia caulescens* (Near Threatened and provincially protected) as well as large populations of *Merwillia plumbea* (Near Threatened) (Photo plate 9). These species are highly sensitive, and their fragile roots can easily be dislodged from the sheer rock faces. Other species recorded were the shrubby *Helichrysum galpinii*, *Passerina montana* and the national protected tree *Podocarpus cf falcatus*.

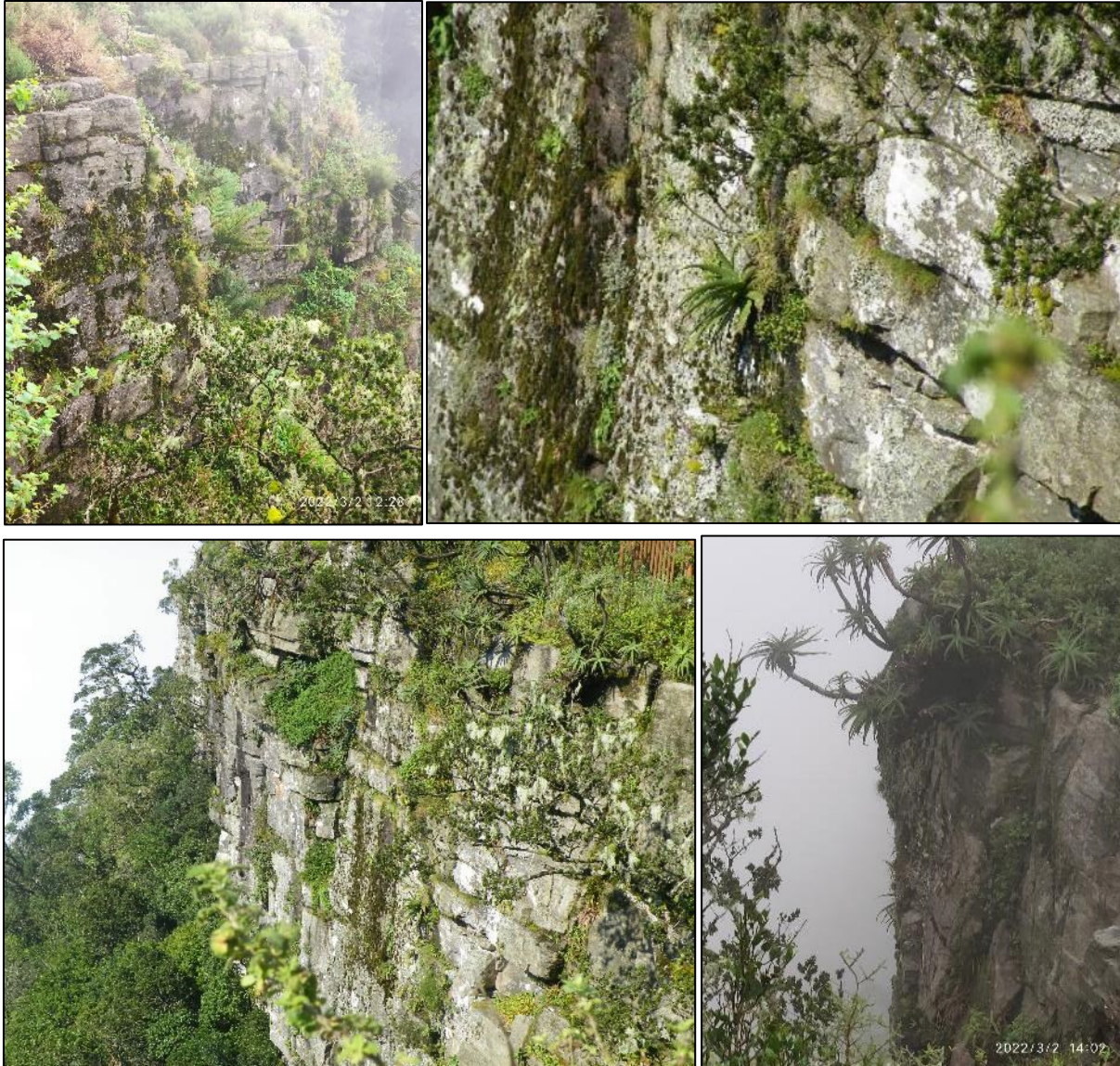


Photo plate 8: Vegetation on cliff face

Table 12: Summary of the prominent and dominant species recorded on the cliff face (SEF, 2013) (Appendix B)

Dominant taxa recorded
<u>Shrubs:</u> <i>Passerina montana</i>
<u>Herbaceous plants:</u> <i>Helichrysum galpinii</i> , <i>Monopsis kowynensis</i> , <i>Streptocarpus fenestra-dei</i>
<u>Succulents:</u> <i>Aloe arborescens</i> , <i>Aloe nubigena</i>
<u>Geophytes:</u> <i>Clivia caulescens</i> , <i>Merwillia plumbea</i> , <i>Schizochilus lilacinus</i>
<u>Trees:</u> <i>Podocarpus cf falcatus</i>

<u>Ferns / mosses:</u> <i>Alsophila dregei</i> , <i>Sellaginella dregei</i> , <i>Usnea</i> sp
Species richness (indigenous species) at the time of the site visits – note that this area was inaccessible and more species are likely present
<u>Forbs / small shrubs:</u> 5 <u>Trees:</u> 2 <u>Ferns/mosses:</u> 2
Protected or threatened plant species
Seven (7) provincially protected species were recorded here, of which some are also nationally of conservation concern. A number of plant species of conservation concern were recorded, and their threat status are as follows: <ul style="list-style-type: none"> • 1 Near Threatened • 1 Rare • 3 Vulnerable One national protected species were recorded: <ul style="list-style-type: none"> • <i>Podocarpus latifolius</i>
Alien and/or invasive plant species
<i>Phytolacca octandra</i> , <i>Pinus patula</i> , <i>Solanum mauritianum</i>
Existing impacts
<ul style="list-style-type: none"> • Alien invasive plant species particularly <i>Phytolacca octandra</i> and <i>Solanum mauritianum</i> have established on the edge of the cliff and are spreading into crevices.
Sensitive ecological features
<ul style="list-style-type: none"> • Highly sensitive vegetation with specific habitat requirements. • Several plant species of conservation concern (sensitive species) were confirmed to occur (SEF, 2013). • Habitat to provincial protected species and threatened species.

4.3.4 Mistbelt forest

Mistbelt forests were recorded directly below the cliffs, as well as on much of the remainder of the study area (Figure 16). Below the cliffs the forest are natural, and according to the 2013 report, the closed canopy comprises large trees such as *Pocarpus falcatus* (yellowwood), *Xymalos monospora* (lemonwood), *Cussonia spicata* (cabbage tree), *Schefflera umbellifera* (false cabbage tree) and *Psychotria capensis* (black bird berry) (SEF, 2013). The shrub layer consisted of *Obetia tenax* (nettle tree) as well as a diversity of fern species including *Alsophilla capensis* (forest tree fern) (Photo plate 10). This area was not directly sampled during the current study as it was inaccessible from the cliffs edge. It is highly likely that numerous threatened species inhabit the forest floor.



Photo plate 9: Forest below the cliff

The drainage line above the cliffs has also been colonised by forest species. The closed forest on the mountain stretched up and around a drainage line (Figure 4 and 10). Common species included *Morella pilulifera* (broad-leaved waxberry), *Rapanea melanophloeos* (Cape beach), *Psychotria capensis* (yellow-flower bird berry), *Rawsonia lucida* (forest peach), *Kiggelaria africana* (wild peach), *Robsonodendron eucleiforme* (silky bark), *Bowkeria cymosa* (escarpment shellflower), *Cussonia spicata* (cabbage tree) and the national protected tree, *Podocarpus latifolius* (real yellowwood). The forest is fragmented by the footpaths and pioneer species and those preferring to grow on the forest edge were recorded (Photo plate 11; Table 13).

The forest floor, particularly along the drainage line, were habitat to numerous orchids, ferns and *Streptocarpus* species (Photo plate 12; Appendix B). Climbers such as *Senecio tamoides* (canary creeper), *Secamone alpini* (monkey rope) and *Dioscorea cotinifolia* (wild yam) were recorded.

A portion of forest, between the existing parking and the R534 road, comprises a thin slither (about 15m in width) of fragmented and disturbed vegetation. Several forest tree species were present, mainly those preferring forest margins (e.g., *Buddleja salvifolia*, *Hypericum revolutum*, *Bowkeria cymosa*, *Psychotria capensis*, *Trimeria grandiflora* and *Cussonia spicata*). Along the R534 road, the vegetation included almost impenetrable stands of *Cliffortia linearifolia* and *Seripheum* species A (Schmidt et al, 2002), as well as invasive species such as *Solanum mauritianum* (bugweed) and *Acacia* species (wattle) (Photo plate 13). No plant species of conservation concern were recorded and although mapped as forest, this area is somewhat degraded with less conservation importance than the forest on the remainder of the project footprint.



Photo plate 10: Forest along the Gods Window footpaths, and the drainage line north-east of the parking area



Photo plate 11: Vegetation within the shaded understorey of the forest along the drainage line, including several protected and threatened species



Photo plate 12: Dense vegetation between the R543 road and the existing parking area

Table 13: Summary of the prominent and dominant species recorded within the mistbelt forests (Appendix B)

Dominant taxa recorded
<u>Sedge</u> : <i>Carex spicato-paniculata</i> , <i>Cyperus cf digitatus</i> , <i>Cyperus albostriatus</i>
<u>Grasses</u> : <i>Setaria lindenbergia</i> , <i>S. megaphylla</i> , <i>Pentaschistis natalensis</i> , <i>Brachypodium flexum</i>
<u>Shrubs</u> : <i>Psoralea latifolia</i> , <i>Cassinopsis ilicifolia</i> ,
<u>Herbaceous plants</u> : <i>Senecio tamoides</i> , <i>Secamone alpine</i> , <i>Dioscorea cotinifolia</i> <i>Hemizygia cf albiflora</i>
<u>Geophytes</u> : <i>Habenaria malacophylla</i> , <i>Crocoshmia mathewsiana</i>

<p><u>Trees:</u> <i>Morella pilulifera</i>, <i>Bowkeria cymosa</i>, <i>Searsia chirendensis</i>, <i>Psychotria capensis</i>, <i>Cussonia spicata</i>, <i>Rapanea melanophloeos</i>, <i>Rawsonia lucida</i>, <i>Peddiea africana</i>, <i>Kiggelaria africana</i>, <i>Robsonodendron eucleiforme</i>, <i>Podocarpus latifolius</i></p> <p><u>Ferns / mosses:</u> <i>Asplenium aethiopicum</i> <i>Alsophila capensis</i> (<i>Cyathea</i>) <i>Cheilanthes cf viridis var viridis</i></p>
<p>Species richness (indigenous species) at the time of the site visits – note that this area is partly inaccessible and more species are likely present</p>
<p><u>Grasses:</u> 5 <u>Forbs / small shrubs:</u> 21 <u>Trees:</u> 28 <u>Sedges:</u> 3 <u>Ferns/mosses:</u> 6 <u>Climbers:</u> 4</p>
<p>Protected or threatened plant species</p> <p>The forests are host to national protected trees, as well as plant species of conservation concern</p> <ul style="list-style-type: none"> • 1 Rare species • 1 Near Threatened • 1 Vulnerable • At least two national protected tree species
<p>Alien and/or invasive plant species</p> <p><i>Lilium formasanum</i>, <i>Pinus patula</i>, <i>Solanum mauritianum</i>, <i>Acacia</i> (wattle)</p>
<p>Existing impacts</p> <ul style="list-style-type: none"> • Encroachment by the scrub into forest areas • Alien invasive plant species • Litter along footpaths
<p>Sensitive ecological features</p> <ul style="list-style-type: none"> • Groundwater recharge zones • Habitat to provincial protected species and likely threatened species, although not recorded at the time.

4.4 Summary of Plants of Conservation Importance

4.4.1 Threatened or Protected Plant Species (TOPS)

Chapter 4, Part 2 of the National Environmental Management: Biodiversity Act (No. 10 of 2004), (NEMBA) provides for listing of plant and animal species as threatened or protected. If a species is listed as threatened, it must be further classified as Critically Endangered, Endangered or Vulnerable. These species are commonly referred to as TOPS listed. The Act defines these classes as follows:

- Critically endangered species: any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered species: any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- Vulnerable species: any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- Protected species: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category will include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Certain activities, known as 'Restricted Activities', are regulated on listed species using permits by a special set of regulations published under the Act. Restricted activities regulated under the act are keeping, moving, having in possession, importing and exporting, and selling. The first list of threatened and protected species published under NEMBA was published in the government gazette on the 23rd of February 2007 along with the Regulations on Threatened or Protected Species.

The site offers suitable habitat for several TOP species, of which *Clivia caulescens* and *Merwillia plumbea* (listed as Medicinal: Protected) were confirmed to occur (see Appendix C for more details).

4.4.2 Plant Species of Conservation Concern (PSCC)

Plants of conservation concern are those plants that are important for South Africa's conservation decision making processes and include all plants that are Threatened, Extinct in the wild, Data deficient, Near-threatened, Critically rare, Rare and Declining (Figure 17). Chapter 4, Part 2 of NEMA Biodiversity Act, 2004 (Act No. 10, 2004) provides for listing of species that are threatened or in need of protection to ensure their survival in the wild, while regulating the activities, including trade, which may involve such listed threatened or protected species and activities which may have a potential impact on their long-term survival.

A list of plants of conservation concern was compiled using information from the South African National Biodiversity Institute's (SANBI) checklist (SANBI, 2009), Raimondo *et al*, (2009), information received

from the Mpumalanga Tourism and Parks Agency (MTPA) for the site, the national web-based screening tool report and the data from the existing vegetation assessment undertaken in 2013 (SEF, 2013).

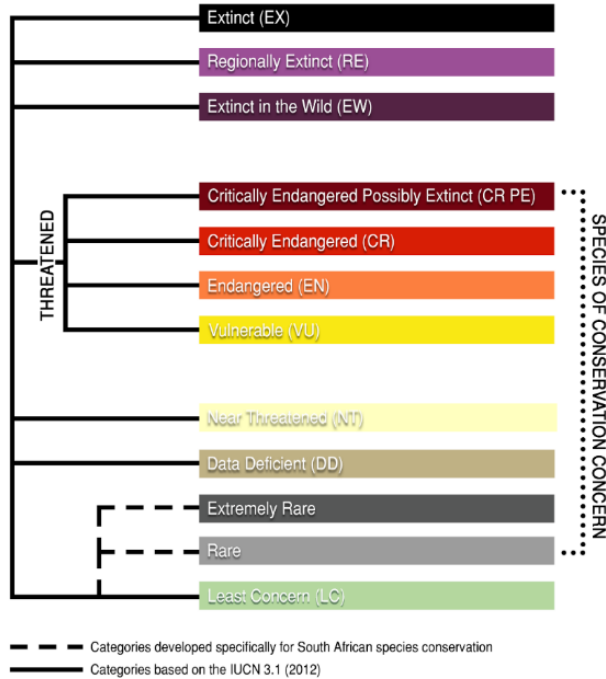


Figure 17: Categories of species of conservation concern (SCC) modified from the IUCN's extinction risk categories (reproduced in part from IUCN, 2012).

4.4.2.1 Plant species of conservation concern results and compliance statement

Appendix C lists thirty-eight (38) species of conservation concern that has been compiled using the data listed above. Of these species, three was historically classified as Declining; however, it has been reassessed to Least Concern. The numbers of these plants are still decreasing and therefor it is listed here as best practise.

The table below lists the number in each threat status that has been confirmed to occur and that is likely to occur. In total, ten (10) species of conservation concern were confirmed to occur. Appendix C gives more details on the possible size of populations and provides a map wherein confirmed localities, including those confirmed in 2013 by SEF, are geographically represented.

Table 14: Number and threat status of confirmed and highly likely to occur species (see Appendix C for details)

Threat status	Number of species confirmed to occur	Number of species that has a medium to high possibility of occurrence.
Endangered	-	2
Vulnerable	3	3
Near Threatened	2	-
Data deficient (taxonomic problems)	1	-
Rare	4	2
Total	10	7

4.4.2.2 Recommended action

- Inaccessible areas were not sampled; however, the areas that will directly be impacted on by the skywalk and skybridge must be assessed to verify the species of concern, and the number of each, that will be directly impacted on the cliff face. This will involve abseiling along the final locality and anchor points of the skywalk and -bridge.
- The exact footprint of the upgrade of the footpaths must be provided to the specialist to assess the number of species of conservation concern, as well as national protected species, that will be impacted thereby.
- Some orchid species were not in flower and the species need to be confirmed in the flowering period.

4.4.3 Provincially Protected Plants

The project area could support several plant species that are provincially protected by the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) (MNCA). These species may not be removed, pruned or damaged without a permit from the Mpumalanga Tourism and Parks Agency (MTPA). These species are most likely to occur along drainage lines and within undisturbed bushveld. The table below lists the provincially protected species recorded:

Table 15: Provincially protected species recorded and some species that are likely to occur

Protected species	Species recorded on site	Vegetation group (see map in Appendix C)
All fern species, except <i>Pteridium aquilinum</i> (bracken fern)	<i>Alsophila capensis</i> , <i>A. dregei</i> , <i>Asplenium aethiopicum</i> , <i>Blechnum punctulatum</i> , <i>Cheilanthes cf hirta</i> , <i>C. cf viridis var viridis</i> , <i>Dicranopteris linearis</i> , <i>Pellaea calomelanos</i> , <i>Pleopeltis macrocarpa</i>	Forests and scrubveld

Protected species	Species recorded on site	Vegetation group (see map in Appendix C)
All species of the Aloe genus, naturally occurring in Mpumalanga	<i>Aloe arborescens</i> and <i>Aloe nubigena</i>	<i>Aloe arborescens-Clivia caulescens</i> cliff edge, and vertical cliffs
All <i>Dioscorea spp</i>	<i>Dioscorea cotinifolia</i>	Forest, rocky areas close to cliff edge
Orchid family	<i>Habenaria-</i> , <i>Disperis-</i> , <i>Eulophia</i> , <i>Polystachya-Schizochilus-</i> , <i>Bronwlea</i> and <i>Stenoglottis</i> species	Mistbelt forest and <i>Passerina montana-Scleria transvaalensis</i> scrubveld
All Podocarpus species	<i>Podocarpus latifolius</i> and <i>P falcatus</i> (SEF, 2013)	Forests
Species likely to be present		
All species of Gladioli	<i>Gladiolus saxatalis</i>	Vertical cliffs
All <i>Ocotea</i> species	<i>Ocotea bullata</i> , <i>O kenyensis</i>	Forests

4.4.4 National Protected Trees

The National Forest Act, 1998 (Act No. 84 of 1998) enforces the protection of several indigenous trees. The removal, thinning or relocation of protected trees will require a permit from the Department of Forestry, Fisheries and the Environment (DFFE) (Notice of the List of Protected Tree Species under the National Forests Act, 1998 (ACT NO 84 OF 1998), Notice 44204, Government Gazette, 1 March 2021).

The table below lists the protected tree species that was confirmed to occur, as well as those that could be present within the project area and has a high likelihood of being present.

Table 16: National protected tree species recorded and other species that are likely to occur

Species	Common name	Vegetation group – see Figure 18 Note these are the minimum localities which was recorded in walked transects or sampled areas. More individuals are likely present.
<i>Podocarpus latifolius</i> and <i>P falcatus</i> (SEF, 2013)	Yellowwoods	Forest vegetation, numerous individuals of <i>P latifolius</i> are present along the existing walking paths, along the cliff edge and at the proposed locality for the Prestressed Steel Tank
Trees likely to be present however not yet recorded		
<i>Curtissia dentata</i>	Assegai tree	Evergreen forests
<i>Ocotea bullata</i>	Stinkwood	Forests
<i>Warburgia salutaris</i>	Pepper bark	Forest

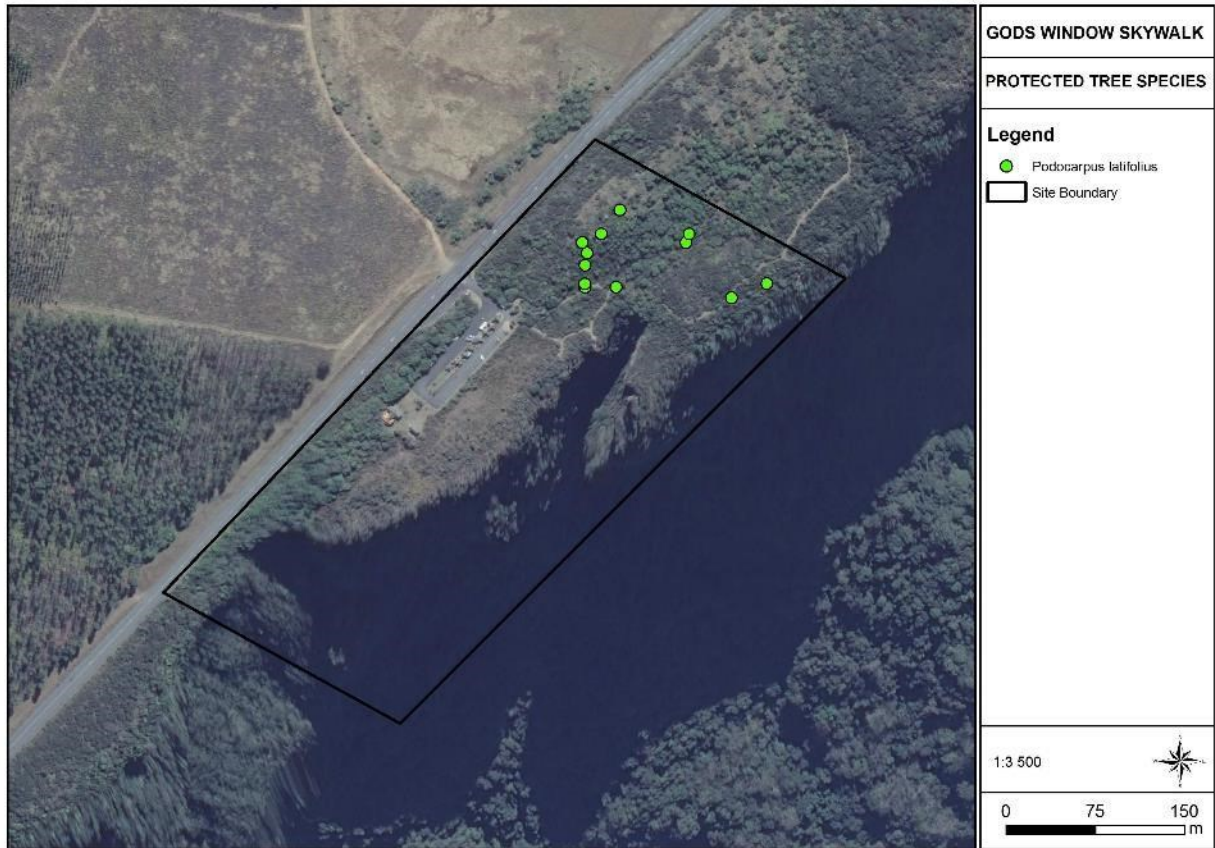


Figure 18: Protected tree localities in walked transects. Note that this tree is also present on the cliff face

4.5 Alien Invasive Plant Species

The project area is infested with alien invasive plant species which can significantly degrade the vegetation. Any project related impacts could result in the infestation of the disturbed areas by alien invasive plant species. Subsequently, remaining natural vegetation and available water resources will degrade further. **The potential increase in alien invasive plant species is one of the major impacts associated with this project.**

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) is the most recent legislation pertaining to alien invasive plant species. In September 2020, an updated list of Alien

Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 43726, 18 September 2020. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.

Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.

Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.

Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

The alien plant species identified on the study site are listed in Appendix B and sixteen (16) category 1b species recorded are listed in the table below. Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- (a) notify the competent authority in writing
- (b) take steps to manage the listed invasive species in compliance with
 - (i) section 75 of the Act;
 - (ii) the relevant invasive species management programme developed in terms of regulation 4;
 - and
 - (iii) any directive issued in terms of section 73(3) of the Act.

Table 17: Category 1b invasive plant species and the vegetation group(s) it was recorded in.

Species	Common name	Vegetation groups
<i>Canna indica</i>	Garden canna	Scrubveld at parking area
<i>Lilium formasanum</i>	St Joseph lily	Entire site
<i>Rubus cuneifolius</i>	American bramble	Most vegetation groups, however, limited in forest areas
<i>Solanum mauritianum</i>	Bugweed	High frequency along the <i>Aloe arborescens-Clivia caulescens</i> cliff edge, as well as in the scrubveld and degraded forest
<i>Solanum pseudocapsicum</i>	Jerusalem Cherry	Scrubveld and degraded forest
<i>Verbena bonariensis</i>	Wild Verbena	Degraded forest
<i>Phytolacca octandra</i>	Inkberry	<i>Aloe arborescens-Clivia caulescens</i> cliff edge

5. SITE ECOLOGICAL IMPORTANCE

It has been clearly demonstrated that vegetation not only forms the basis of the trophic pyramid in an ecosystem, but also plays a crucial role in providing the physical habitat within which organisms complete their life cycles (Kent & Coker 1992). Therefore, the vegetation of an area will largely determine the ecological sensitivity thereof.

5.1 Rating and Analysis

The Site Ecological Importance (SEI) in terms of the vegetation, was based on the site verification assessment, and is discussed, and mapped as per the requirements of the Species Environmental Assessment Guideline (SANBI, 2020) and detailed in the methodology section (Section 2.5). **SEI** is a function of the (BI) of the receptor (e.g. species of conservation concern, the vegetation/fauna community or habitat type present on the site and its resilience to impacts as follows:

$$\text{SEI} = \text{Biodiversity Importance (BI)} + \text{Receptor Resilience (RR)}$$

Wherein **BI** in turn is:

$$\text{BI} = \text{Conservation Importance (CI)} + \text{Functional Integrity (FI)}$$

Table 18: Scoring of vegetation that occurs within project site and Alternative corridors

Broad vegetation community		Conservation Importance (CI) ¹	Functional Integrity (FI)	Biodiversity Importance (BI)	Receptor Resilience (RR)	Site Ecological Importance (SEI) – mitigation
Scrubveld	<i>Passerina montana-Scleria transvaalensis</i>	High	Medium ²	Medium	Medium ³	Medium (Minimise & Restore)
	<i>Cliffortia linearifolia-Seripheum species A</i>	High	Medium ²	Medium	Medium	Medium (Minimise & Restore)
<i>Aloe arborescens-Clivia caulescens</i> cliff edge		High	High ⁴	High	Very-low ⁵	Very High (Avoid)
Vegetation on vertical cliffs		High	High	High	Very-low	Very High (Avoid)
Forest	Mistbelt forest	High	High ³	High	Low ⁶	High (Avoid & Minimise)
	Degraded forest	Medium ⁷	Medium	Medium	Medium	Medium (Minimise & Restore)

¹ Endangered ecosystem (2011 listed ecosystems)

² (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type, mostly minor current negative ecological impacts

³ Recovers slowly

⁴ Good habitat connectivity, only minor current negative ecological impacts

⁵ Unable to recover from major impacts.

⁶ Unlikely to recover fully

⁷ More than 50 % of receptor contains natural habitat with potential to support SCC

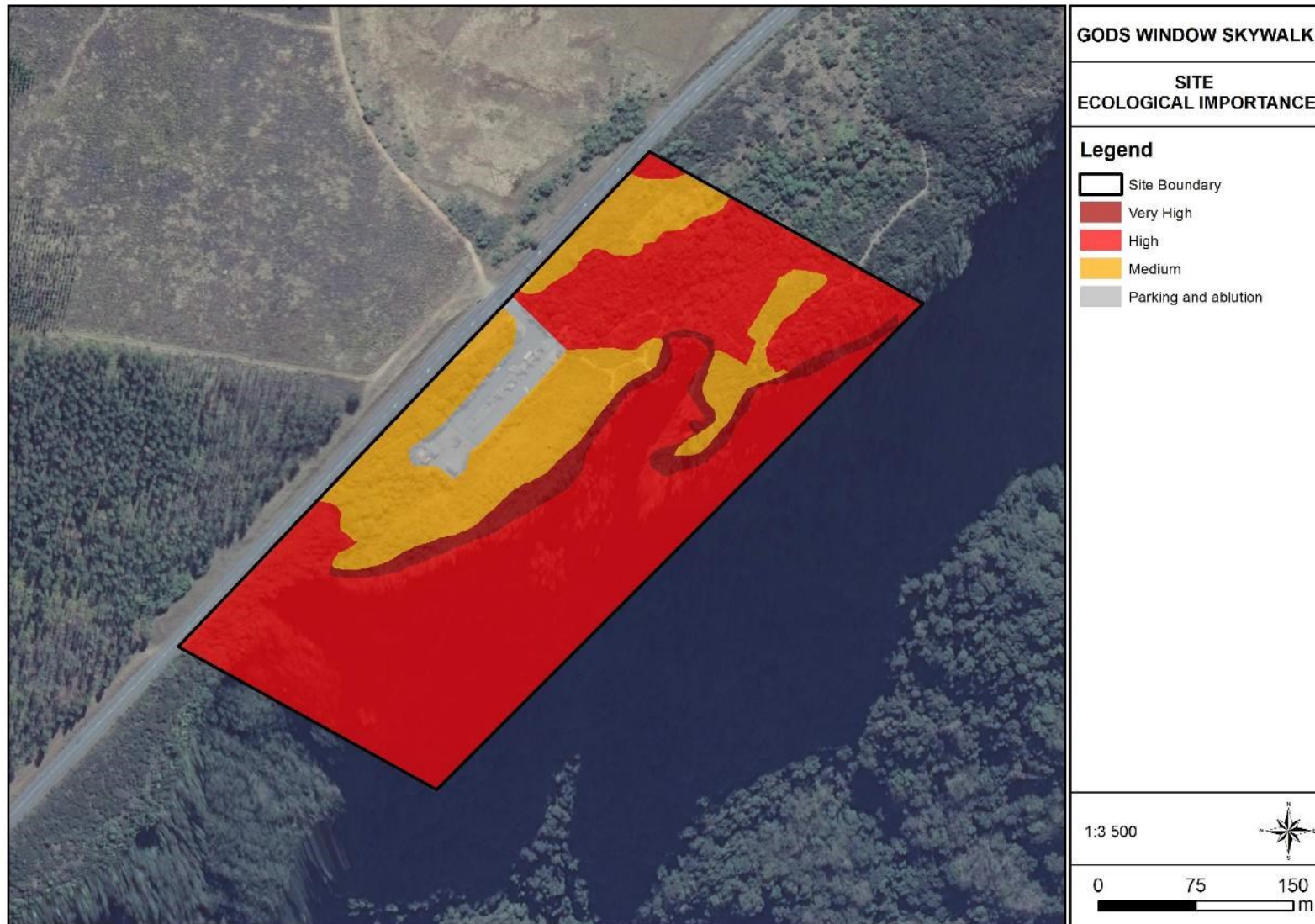


Figure 19: Site Ecological Sensitivity Map. Sensitive species habitats and localities are given in Appendix C

6. IMPACT ASSESSMENT

Mankind depends on the natural environment for many ecological services provided for by ecosystems, ecological processes, and plant species in general. However, any development activities in natural systems will impact on the surrounding natural environment and usually in a negative way. To limit or negate these impacts, the source, extent, duration and intensity of the possible impacts needs to be identified. Once the significance of the impacts is understood, the development could both adequately plan for and mitigate these impacts to a best practise and acceptable level. However, if the impacts are significant, especially in already threatened ecosystems and vegetation units, and no adequate mitigation measures could reduce or avert these impacts, then the development should not be allowed to proceed.

6.1 Impact statement

The project area is situated within a protected area and comprise mainly of natural vegetation. According to the 2011 Listed Ecosystems, Gods Window falls within the Endangered Blyde Quartzite Grasslands. However, the recent National Biodiversity Assessment, places the site in an ecosystem of Least Concern. The National List of Threatened Terrestrial Ecosystems has not yet been revised and therefore the gazetted 2011 Listed Ecosystems is still in force.

The vegetation further includes sensitive and unique habitats, and several plant species of conservation concern were confirmed to occur or are highly likely to be present. The proposed project will have an impact on sensitive vegetation which is difficult, if not impossible, to rehabilitate. Some impacts as listed below can be mitigated, however, some impacts can not be mitigated. These is likely operational impacts that can not be envisaged at this stage.

The March 2022 layout is discussed, after which the amended July 2022 layout is considered. Lastly, the possible impacts that the upgrade of the footpaths could have are listed.

6.1.1 Skywalk development footprint: March 2022

The greatest impact on vegetation will be the total removal of vegetation of medium and very-high sensitivity for the main development footprint. Figure 19 and 20 presents the architects impression of the development. At the time of writing the March report, the proposed layout of the development would have the following impacts:

Direct impacts during construction

- Destruction of the *Passerina montana-Scleria transvaalensis* scrubveld. The March 2022 layout destroys the entire *Passerina montana -Scleria transvaalensis* scrubveld (Figure 20). The layout blocks any ecological corridors on the escarpment in a southerly and northerly direction and provides no "steppingstones" through the development. The original design in 2013 was

smaller and humbly positioned with options to conserve portions of *Passerina montana* -*Scleria transvaalensis* scrubveld on either side of the development, including movement corridors (compare Figures 20, 21 and 22).

- Destruction of the *Aloe arborescens*-*Clivia caulescens* cliff edge vegetation and sensitive plant species.
- Destruction of sensitive plant species on the vertical cliff (several threatened species can be impacted on).
- Falling objects impacting on the sensitive vegetation along and below the cliff.
- Introduction of alien invasive plant species to the area and lead to an increase of the invasive species already present.

Indirect impacts during construction and operating:

- Change in hydrology: if the scrubveld is developed it will impact the water regime / available water for vegetation on the cliff's edge, on the cliff, as well as the forest below.
- Overshadowing of the vegetation on the cliff face by the skywalk and skybridge.
- These structures could also have a rain shadow effect, or concentrate runoff along the cliff face, destroying vegetation in crevices.
- Falling objects impacting on the sensitive vegetation along and below the cliff (e.g. litter).
- Introduction of alien invasive plant species to the area, either as planted ornamentals or via visitors.
- Modification of natural vegetation: the vegetation within the development footprint might be landscaped and irrigated (including the use of species not naturally occurring in the area). This could change the species composition and abundance (or density) of the vegetation around the development footprint.



Figure 20: Proposed development layout in 2022



Figure 21: Impression of the development with the skywalk and skybridge visible (right)

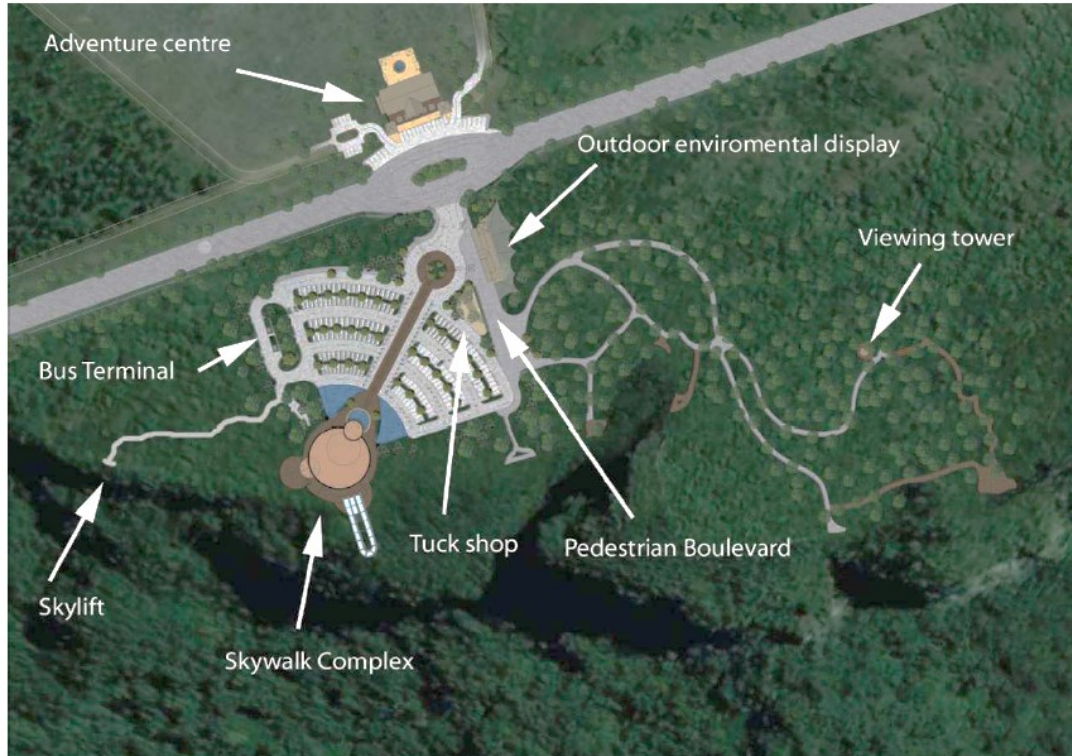


Figure 22: Historic development layout as per SEF, 2014 wetland report

6.1.2 Amended Skywalk Development footprint: July 2022

Based on various sensitivities on the site that could be impacted on by the March 2022 layout, meetings and discussions were held between the team members (including specialists, architects, engineers, and environmental practitioners) on the 7th and 20th of June 2022.

The discussions resulted in an amended layout in which a 15m set back from the cliff face were incorporated to protect sensitive vegetation and corridors, as well as a slight reduction in the development footprint (Figure 23). The amended July 2022 layout will still impact on the majority of the *Passerina montana* -*Scleria transvaalensis* scrubveld. However, the design aims to recreate this vegetation on the roof. Furthermore, the 15m setback will aim to conserve and limit impact to the *Aloe arborescens*-*Clivia caulescens* cliff edge vegetation and sensitive plant species.

A current concern, however, is the proposed fire mitigation measures which states the following (Zutari, 2022):

- Create 5m wide vegetation free border zone around buildings
- Create 3m wide vegetation free border zone around roof openings
- Create 15m wide vegetation free, fire break zone between roof vegetation and natural bush / plantation on northeast entrance side onto roof

- Plant vegetation that has no or very low fire risk to be reinstated
- Install irrigation system to ensure green and wet vegetation on roof and in front of building during dry season
- Maintain and keep escape feeder routes and walkways free from vegetation

This mitigation will reduce the 15m setback, to 10m or less, particularly as edge effects will take place and therefore the impacts of the new layout and fire mitigation remain more-or-less the same as the March 2022 layout.

Direct impacts during construction

- Destruction of the *Passerina montana-Scleria transvaalensis* scrubveld. The layout does allow for the continuation of ecological corridors over the roof. However, it must be noted that natural vegetation, especially in the absence of fire and natural processes, are difficult to recreate. The planted or relocated vegetation will likely find a balance as scrubveld with some difference in species composition. movement corridors (compare Figures 20, 21 and 22).
- Destruction of the *Aloe arborescens-Clivia caulescens* cliff edge vegetation and sensitive plant species.
- Destruction of sensitive plant species on the vertical cliff (several threatened species can be impacted on).
- Falling objects impacting on the sensitive vegetation along and below the cliff.
- Introduction of alien invasive plant species to the area and lead to an increase of the invasive species already present.

Indirect impacts during construction and operating:

- Change in hydrology: if the scrubveld is developed it will impact the water regime / available water for vegetation on the cliff's edge, on the cliff, as well as the forest below.
- Possible overshadowing of the vegetation on the cliff face by the skywalk and skybridge.
- These structures could also have a rain shadow effect, or concentrate runoff along the cliff face, destroying vegetation in crevices.
- Falling objects impacting on the sensitive vegetation along and below the cliff (e.g. litter).
- Introduction of alien invasive plant species to the area, either as planted ornamentals or via visitors.
- Modification of natural vegetation: the vegetation within the development footprint might be landscaped and irrigated (including the use of species not naturally occurring in the area). This could change the species composition and abundance (or density) of the vegetation around the development footprint.

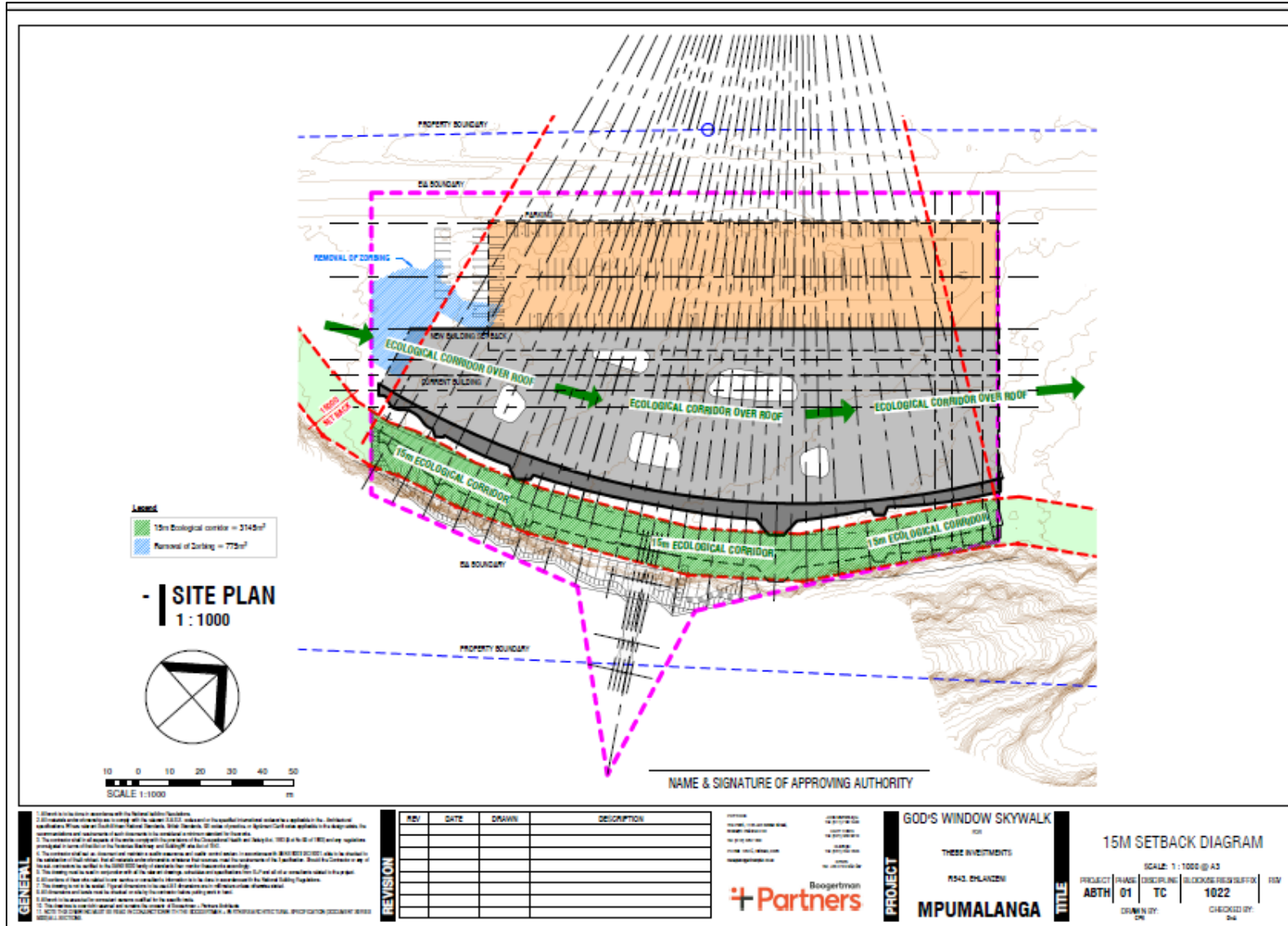


Figure 23: Amended layout as received on 6 July 2022

6.1.3 Upgrade of footpaths

The methodology and details of the upgrade were not known at the time of writing this report. However, the following impacts are envisaged and can be mitigated:

- Removal of damage to protected- and sensitive plant species, including the national protected tree *Podocarpus latifolius*.
- Change in current drainage along the footpaths that could channel stormwater into sensitive vegetation groupings.
- Trampling and damage to vegetation by workers and equipment.
- Pollution of soil by cement etc

6.2 Impact Assessment Criteria

The possible impacts, as described in the next section, were assessed based on the Significance Rating as received from Envirolution Consulting. The Significance of the impact is calculated as follows and rating significance is explained below:

Significance = Consequence (Extent + Duration+ Magnitude) X Probability
--

- I. The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- II. The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- III. The **duration**, wherein it will be indicated whether
 - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
 - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
 - medium-term (5–15 years) – assigned a score of 3;
 - long term (> 15 years) - assigned a score of 4; or
 - permanent - assigned a score of 5;
- IV. The **consequences (magnitude)**, quantified on a scale from 0-10, where
 - 0 is small and will have no effect on the environment,
 - 2 is minor and will not result in an impact on processes,
 - 4 is low and will cause a slight impact on processes,
 - 6 is moderate and will result in processes continuing but in a modified way,
 - 8 is high (processes are altered to the extent that they temporarily cease), and
 - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

- V. The **probability** of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where
- 1 is very improbable (probably will not happen),
 - 2 is improbable (some possibility, but low likelihood),
 - 3 is probable (distinct possibility),
 - 4 is highly probable (most likely) and
 - 5 is definite (impact will occur regardless of any prevention measures).
- VI. The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- VII. The **status**, which will be described as either positive, negative or neutral.
- VIII. The degree to which the impact can be reversed.
- IX. The degree to which the impact may cause irreplaceable loss of resources.
- X. The degree to which the impact can be mitigated.

The **significance** weightings for each potential impact are as follows:

- **< 30 points: Low** (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- **30-60 points: Medium** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- **60 points: High** (i.e. where the impact must have an influence on the decision process to develop in the area).

6.3 Impact Assessments

The tables below list the activities that could impact on the vegetation because of the construction of operation of the development. The tables also list recommended mitigation measures to limit the impacts.

6.3.1 Destruction of natural vegetation of medium sensitivity

Nature of impact during construction:

- The proposed layout will remove the entire *Passerina montana-Scelria transvaalensis* scrubveld
- The removal of vegetation from the site could also lead to a loss in the current ecological function (e.g., groundwater recharge zone) and general loss of species and genetic diversity.
- The removal of this vegetation could have a detrimental indirect effect on the vegetation of the cliff face (e.g. effect on the hydrology of the area)
- Areas that will not be developed, but that may be impacted on by construction related activities (e.g. where building materials are stored) must also be considered.
- In addition, the illegal disposal of construction material such as oil, could leach into soils which maybe hydrologically connected tot eh vegetation on the cliff face, thereby impacting on it.

Nature of impact during operation		
<ul style="list-style-type: none"> • Edge effects include trampling by visitors – if any of this vegetation remains. • It is likely that fire will be prevented to safeguard infrastructure, which could result in a change of the vegetation structure (increased woody vegetation) around the development and reduction of scrubveld. • Lack of ecological corridor for movement of species / pollinators above the cliff face 		
CONSTRUCTION PHASE	Without mitigation	With mitigation
Probability	Definite (5)	Definite (5)
Duration	Permanent (5)	Permanent (3)
Extent	Indirect impacts will extend beyond the site to cliff face (3)	Site (2)
Magnitude	Very high (10)	Moderate (8) - if processes can continue albeit in a modified way
Significance	90 (Very High)	65 (High)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE (assuming construction mitigation was implemented)		
Probability	Highly probable (4)	Probable (3)
Duration	Permanent (5)	Long term (4)
Extent	Site and surrounds (2)	Dedicated footprint (1)
Magnitude	High (8)	Moderate (6)
Significance	60 (High)	33 (Medium)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes, destruction of the entire <i>Passerina montana-Scleria transvaalensis</i> scrubveld will impact on ground water recharge zones, which could impact sensitive species growing on the <i>Aloe arborescens-Clivia caulescens</i> cliff face and the vertical cliffs. It is highly likely that the development will alter ecological processes.	
Can impacts be mitigated?	Some impacts can be mitigated, however, the impact on vegetation along the cliff face due to the destruction of the <i>Passerina montana-Scleria transvaalensis</i> scrubveld is difficult to envisage and therefore may not be adequately mitigated.	
Mitigation:		
Planning phase		
<ul style="list-style-type: none"> • Reduce the proposed development footprint to allow the conservation of some <i>Passerina montana-Scleria transvaalensis</i> scrubveld as open space around or within the development. This will ensure an ecological pathway through the development and conservation of species. It can also help maintain the function of this vegetation as groundwater recharge zones. However, such vegetation will have to be managed to ensure it persists. • The planned layout of the site must ensure that visitors activities can be restricted to a footprint and not sprawl out of control (e.g., increase in informal footpaths paths e.g. people taking shortcut through naturally vegetated areas). In this regard, it is recommended that no destructive activities such as quad biking or mountain biking are ever allowed as part of the entertainment at the site 		

- Planning of the construction site must incorporate eventual rehabilitation of areas destroyed / damaged by construction and that does not contain infrastructure.
- Construction camps and laydown areas for equipment and materials must be planned outside of sensitive vegetation and may not be placed within areas that are not earmarked for development.
- The activities on the site should be managed in accordance with an ecological management plan. This plan must include the construction as well as the operational phase of the development.

Construction:

An independent Ecological Control Officer (ECO) should be appointed to oversee construction.

- Keep the development footprint as small as possible.
- Ensure that the areas that are not to be developed are protected from construction and related activities.
- A temporary fence or demarcation must be erected around the construction area (include the actual footprint, as well as areas where material is stored) to prevent access to adjacent sensitive vegetation.
- Maintain site demarcations in position until the cessation of construction work.
- Only remove vegetation where necessary and retain vegetation in place for as long as possible prior to removal.
- Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area.
- Formalise access roads and make use of existing roads and tracks where feasible, rather than creating new routes through naturally vegetated areas.
- A vegetation rehabilitation plan should already be implemented during construction to rehabilitate areas that will be affected by edge effects. Such a plan should use indigenous species from the study area and must restore disturbed areas beyond the footprint of the infrastructure to what it was prior to construction, thereby making the impact on the remainder of the site negligible in the long term. Natural colonisation could take a long time, in which vegetation may degrade further or become dominated by encroacher or alien invasive plant species. Therefore, timeous rehabilitation is imperative. Even in the event of good rains, annual pioneer plants are short-lived and therefore an effort must be made to keep as many shrubs in place as possible or to replace these as part of rehabilitation.
- Where topsoil needs to be removed, store such in a separate area where such soils can be protected until they can be re-used for post-construction rehabilitation where applicable. Never mix topsoil with subsoils or other spoil materials.
- After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction.
- Prevent spillage of construction material, oils or other chemicals, strictly prohibit other pollution
- Ensure there is a method statement in place to remedy any accidental spillages immediately
- Do not dump litter or material within any vegetated areas.
- No open fires are permitted during construction.

Operational:

- Rehabilitate construction camps and any other vegetation that was impacted on by the construction.

- Any disturbances to the adjacent vegetation must be rehabilitated in accordance with the rehabilitation plan. **This includes prevention of infestation by alien and invasive plant species on the site.**
- Use indigenous plants local to the area where needed to stabilise soils, provide shade etc.
- No alien and invasive plant species as listed on 18 September 2020 in the list of Alien Invasive Species published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 43726 of 2020) may be planted or allowed to grow within the development.
- Maintenance, security or operational workers may not trample natural vegetation beyond the site and must be restricted to previously disturbed footprint.
- After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction.
- Do not plant shade trees that does not naturally occur at Gods Window.
- Erect signage educating visitors on sensitive environment and the result of edge effects.
- Ensure that visitors stay on dedicated paths and not remove plants

Cumulative impacts:

The successful project may want to increase activities on the site and expand into the natural footprint.

Residual Risks:

- Fragmentation of natural habitats
- Localised alteration of soil surface characteristics and loss of hydrological regime
- The colonisation of the disturbance footprint by alien invasive plant species.
- Change in ecological processes

6.3.2 Destruction of natural vegetation of high and very high sensitivity

Nature of impact during construction:

- Removal and damage to the *Aloe arborescens-Clivia caulescens* cliff face vegetation (very high sensitivity)
- The damage to or destruction of vegetation along the vertical cliff which was rated as very high sensitivity (constructing of skywalk and skybridge)
- Edge effects into the mistbelt forest surrounding the development, as well as below the cliff face (high sensitivity)
- Areas that will not be developed, but that may be impacted on by construction related activities (e.g., where building materials are stored) must also be considered.
- Falling objects / building material dropped from the construction site onto these sensitive systems.
- Contaminated rainwater from the construction site, could wash down the cliff during heavy rainfall.

Nature of impact during operation

- Edge effects include trampling by visitors, removal of plants along the skywalk, as well as maintenance activities.
- Overshadowing of vegetation underneath the Skywalk and Skybridge.
- Rain shadow effect caused by the infrastructure, preventing mist and rainfall on plants along and below the Skywalk and Skybridge.
- Magnifying effect of sunlight being concentrated through the glass skywalk, potentially burning plants
- Water being channelled and flow concentrated from the bridge or skywalk downwards can dislodge sensitive plant species. These species grow in shallow soils in crevices and can easily be dislodged.
- Falling objects from visitors and litter.

<ul style="list-style-type: none"> Chemicals used to clean the skywalk and skybridge can drip or be flushed from the surfaces and will likely kill plant species on the cliff face and change soil pH. A faulty Prestressed Steel Tank and the associated pipeline will result in damage to forest vegetation as well as erosion within vegetation that harbours plant species of conservation concern. 		
	Without mitigation	With mitigation
CONSTRUCTION PHASE		
Probability	Definite (5)	Highly probable (4)
Duration	Permanent (5)	Medium-term (3)
Extent	Indirect impacts will extend beyond the site to cliff face and below (3)	Limited development footprint (2)
Magnitude	Very high (10)	Moderate (8) - if processes can continue albeit in a modified way
Significance	90 (high)	52 (medium)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Definite (5)	Probable (3)
Duration	Medium term (3)	Short term (2)
Extent	Limited to Local Area (2)	Limited to Local Area (2)
Magnitude	High (8)	Moderate (6)
Significance	65 (high)	30 (medium)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes	
Mitigation:		
Planning:		
<ul style="list-style-type: none"> The development layout should be set back from the cliff edge to protect and conserve the <i>Aloe arborescens-Clivia caulescens</i> cliff face vegetation. This vegetation includes a Vulnerable species, a Near-Threatened species as well as a Data deficient species. A set back of a minimum of 15m from the cliff edge will protect the vegetation from edge effects. Only the access to the skywalk and skybridge may traverse this vegetation. A vegetation specialist must assess the final footprint on this vegetation to determine the species that will need to be relocated. Where such species are within the development footprint, they may only be removed once a permit for the removal / pruning was granted by the relevant authority. The panels of the skybridge must be manufactured from material that will let sunlight through, without concentrating the light which could burn sensitive plants below the skywalk. Ideally these panels should allow rainwater through, without concentrating / channelling the water onto plant species below the skywalk. These species grow in very shallow soils in crevices or on rocks and can easily be dislodged by concentrated waterflow. Position the skybridge <u>away from the cliff face</u> (e.g., allow for a gap between the cliff face and the skybridge). This should allow rainwater to trickle down the cliff face unhindered and limit the impact on the vegetation on the cliff face. 		

- Keep the width and length of the skywalk as narrow and short as possible as to limit its impact on the cliff face. Ideally, the skywalk should be reconsidered due to its likely impact on sensitive plant species.
- Ensure that litter can not fall from the skywalk or skybridge (e.g. place nets along the skywalk / below it, to prevent litter falling down to the forest).
- Design a stormwater management plan that will prevent any water from the development footprint from running down the cliff face.

Construction:

An independent Ecological Control Officer (ECO) should be appointed to oversee construction.

- Keep the development footprint within the high and very high SEI as small as possible.
- Prevent polluted water running off the construction area and down the cliff or within the forested areas - implement a storm water management plan.
- Keep the work area (e.g. area to be disturbed) to a minimum. Manual labour is recommended in high and very high sensitivity areas, with no heavy vehicles driving over or turning within the high SEI areas
- A temporary fence or demarcation must be erected around the construction area (include the actual footprint, as well as areas where material is stored) to prevent access to adjacent vegetation.
- Place nets under the construction site to prevent falling building material impacting on the *Aloe arborescens-Clivia caulescens* cliff face vegetation, vegetation along the cliff face and the forest below. The erection of these nets should however be overseen by a suitably qualified botanist to ensure that the various threatened plants that have been recorded on the cliffs are not damaged.
- Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area.
- No open fires are permitted within naturally vegetated areas.
- Implement a vegetation rehabilitation plan. Natural colonisation could take a long time, in which vegetation may degrade (bush encroachment) or be invaded by alien invasive plant species. Therefore, timeous rehabilitation is imperative.
- Construction workers may not remove flora and neither may anyone collect seed from the plants without permission from the local authority.
- Where topsoils need to be removed, store such in a separate area where such soils can be protected until they can be re-used for post-construction rehabilitation
 - Never mix topsoils with subsoils or other spoil materials
- Maintain site demarcations in position until the cessation of construction work.
- After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction.

Operational and maintenance:

- After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction.
- Ensure that maintenance work does not take place haphazardly, but according to a fixed plan.
- Cordon off areas that are under rehabilitation as no-go areas. If necessary, these areas should be fenced off to prevent vehicular, and pedestrian access.
- Maintenance workers may not trample natural vegetation and work should be restricted to previously disturbed footprint. In addition, mitigation measures as set out for the construction phase should be adhered to.

<ul style="list-style-type: none"> Do not use chemicals to clean the skywalk and skybridge. Cleaning solutions made of organic ingredients and that are biodegradable should be used, and even then, these solutions should no be allowed to drip or wash of the surfaces. Visitors should not be allowed to take any food or beverages onto the Skywalk and Skybridge, this will limit the possibility of rubbish thrown into the cliffs and mistbelt forest below the walks The area below the Skywalk complex should be cleaned every four (4) months from any rubbish by qualified rope access technicians. Ensure stormwater management systems are regularly checked and cleared of debris.
<p>Cumulative impacts:</p> <ul style="list-style-type: none"> Degradation of vegetation along the vertical cliffs and the forests below. Increased littering
<p>Residual Risks:</p> <ul style="list-style-type: none"> Degradation of vegetation along the vertical cliffs and the forests below. Change in ecological processes. Unforeseen impacts.

6.3.3 Removal / Destruction of protected plants and plants of conservation concern

<p>Nature of impact during construction:</p> <ul style="list-style-type: none"> The development will necessitate the removal of plant species of conservation concern, impact on their habitat conditions, pollinators and inevitably the persistence of these species (particularly along the vertical cliff and within the <i>Aloe arborescens-Clivia caulescens</i> cliff face vegetation. This could put further strain on the already declining populations. Falling objects could dislodge sensitive species from the cliff face. The upgrade of pathways will destroy protected tree species and plant species of conservation concern <p>Nature of impact during operation:</p> <ul style="list-style-type: none"> Falling objects and litter, as well as channelled stormwater could dislodge sensitive species from the cliff face. Visitors could pluck flowers and remove plants along the skywalk area. The skywalk could overshadow sensitive species, or concentrate sunlight and alter the species microhabitat, ultimately causing its demise. 		
	Without mitigation	With mitigation
CONSTRUCTION PHASE		
Probability	Definite (5)	Probable (3)
Duration	Permanent (5)	Medium-term (3)
Extent	Limited to Local Area (2)	Limited to local area (2)
Magnitude	Very high (10)	Moderate (8) - if processes can continue albeit in a modified way
Significance	85 (high)	39 (medium)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Highly probable (4)	Probable (3)
Duration	Permanent (5)	Medium term (3)
Extent	Limited to Local Area (2)	Limited to the Site (1)

Magnitude	High (8)	Moderate (6)
Significance	60 (high)	30 (medium)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes, several plant species of conservation concern could be impacted on	
Can impacts be mitigated?	To a degree yes, however, failure to adhere to measures could have detrimental effects	
<p>Mitigation:</p> <p>Planning:</p> <ul style="list-style-type: none"> • Limit the development footprint and the developments impact on areas of very high and high SEI. • Reconsider the need for a skywalk compared to the need to conserve sensitive plant species. As best practise, the skywalk should be limit in its extent and thus resulting impacts. • The development should be set back a minimum of 15m from the cliff edge, thereby conserving the <i>Aloe arborescens-Clivia caulenscens</i> cliff face vegetation. • It is also recommended that the development takes place in a phased approach. The impact of the development on the sensitive plant species on the vertical cliffs can not be entirely foreseen or envisaged as it has not been studied. A Phased approach (e.g. parking, restaurant and Skybridge as Phase 1) could provide time to study the impact of the development prior to phase 2 of the development (skywalk and additions to the restaurant and visitors centre). • The final development layout should be made available to the specialist prior to the plant species assessment that will search for additional plant species of conservation concern. The development footprint will be ground-truthed to verify the impact on the sensitive species. • Sensitive species that are under threat from the construction activity, must be removed by a suitably qualified specialist and replanted as part of vegetation rehabilitation after the construction (note, these plants may only be removed with the permission of the provincial authority). • Implement a plant relocation plan for plant species of concern that was recorded. For species that can not be relocated (e.g. large trees), apply for permit for the pruning / removal thereof. • If the development is to proceed, a management plan for these species, during construction and operation, must be implemented and regularly monitored and reported on to the MTPA. The management body of the development should undertake to conserve and monitor the remaining numbers of these plants along the <i>Aloe arborescens-Clivia caulenscens</i> cliff face and the vertical cliffs. • Implement mitigation as set out in 4.3.2 above. • The final method and plan for upgrading the pathways needs to be submitted to the specialist in order to mark species that must be avoided by the upgrade activities, or be relocated. <p>Construction:</p> <ul style="list-style-type: none"> • Where possible, the species of conservation concern that were confirmed to occur, should be avoided by construction and related activities. The species should be marked or cordoned off to protect them from construction activities and vehicles. Construction workers should be made aware of the species and the aim to protect them from damage. • Prior to construction, a botanist or ecologist must walk the final footprint of the development within the growing and flowering period of the Vulnerable plant species, to determine the number that might be displaced or that may be impacted on by the final development layout. 		

- Where individual plants or subpopulations of the Vulnerable species, as well as provincially protected plants will be impacted on, these plants must be removed and replanted by a botanist / horticulturist. This can only take place once the MTPA has granted a permit to do so.
- Any additional development, other than this proposed development which should still reduce its footprint, is not supported by this assessment.
- Construction workers may not remove any plants, seeds or plant parts other than that necessary for the development footprint
- Before construction is initiated, all areas earmarked for an authorized development must be fenced off from those areas to be retained as an open space system, and all construction-related impacts (including service roads) must be contained within the fenced-off development areas.
- As per above, implement an ecological management plan. This must take place prior to the start of the operational activities and include:
 - a. An Ecological Management Plan must be compiled by a suitably qualified ecologist (at least a BSc (Hons) in Plant Ecology or equivalent) as approved by the Department.
 - b. The implementation of the Ecological Management Plan is the responsibility of an appropriate management authority, such as the management company or section 21 company, vested with the authority to ensure the correct ecological management of the area where the Red List Plant Species population is growing.
 - c. The Ecological Management Plan must –
 - d. Ensure the persistence of the Red List Plant Species population;
 - e. Include a monitoring programme that monitors the size, stage structure and vigour of the Red List Plant Species population as well as threats to the population;
 - f. Facilitate/augment natural ecological processes such as fire and herbivory;
 - g. Provide for the habitat and life history needs of important pollinators;
 - h. Minimise artificial edge effects (e.g. water runoff from developed areas and application of chemicals);
 - i. Include an ongoing monitoring and eradication programme for non-indigenous species with specific emphasis on invasive and weedy species;
 - j. Result in a report back to the Department on an annual basis.
 - k. Mitigatory measures are required to protect the Red List Plant Species population during construction.
- The ECO should take note of any unearthed geophytes or orchids and contact a specialist for the correct naming and threat status of the species. This will determine whether any follow-up action is required.
- Construction workers may not tamper or remove these plants and neither may anyone collect seed from the plants without permission from the local authority.

Operational:

- The relocated species should be monitored for at least three years post relocation. If die back is noted, a specialist should be consulted, and corrective action taken as soon as possible.
- Monitor the impact of the operations on the plant species and vegetation and report back to the Department on an annual basis.

<ul style="list-style-type: none"> Do not use chemicals to clean the skywalk and skybridge. Cleaning solutions made of organic ingredients and that are biodegradable should be used, and even then, these solutions should no be allowed to drip or wash of the surfaces. Visitors should not be allowed to take any food or beverages onto the Skywalk and Skybridge, this will limit the possibility of rubbish thrown into the cliffs and mistbelt forest below the walks The area below the Skywalk complex should be cleaned every four (4) months from any rubbish by qualified rope access technicians. Ensure stormwater management systems are regularly checked and cleared of debris. Educate visitors and prevent removal of and accessibility to plant species of conservation concern
<p>Cumulative impacts:</p> <ul style="list-style-type: none"> The successful project may want to increase activities on the site and expand into the natural footprint. Degradation of vegetation along the vertical cliffs and the forests below. Increased littering
<p>Residual Risks:</p> <ul style="list-style-type: none"> Species removed and relocated as part of rehabilitation could die due to transplantation shock or damage during replanting. Degradation of vegetation along the vertical cliffs and the forests below. Change in ecological processes. Unforeseen impacts.

6.3.4 Potential increase in invasive vegetation, including alien species and indigenous encroacher species

<p>Nature of impact during construction:</p> <ul style="list-style-type: none"> The seed of alien invasive plant species that occur on and in the vicinity of the construction areas could spread into the disturbed and stockpiled soil. Also, the construction vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds or indigenous plants not belonging to this vegetation unit to the construction site. In addition, if rehabilitation of the indigenous vegetation along the route, are unsuccessful or is not enforced, exotic and invasive vegetation may further invade the area. <p>Nature of impact during operation:</p> <ul style="list-style-type: none"> Introduction of alien species via landscaping or visitors 		
	Without mitigation	With mitigation
CONSTRUCTION PHASE		
Probability	Highly probable (4)	Probable (3)
Duration	Long-term (4)	Short-term (2)
Extent	Local Area (2)	Site bound (1)
Magnitude	High (8)	Low (4)
Significance	56 (medium)	21 (low)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Long term (4)	Short term (2)

Extent	Limited to Local Area (2)	Limited to the Site (1)
Magnitude	Low (4)	Minor (2)
Significance	30 (medium)	10 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	
Mitigation:		
Construction:		
<ul style="list-style-type: none"> • Alien invasive species, in particular category 1b species that were identified within the study area, should be removed from the development footprint and immediate surrounds, prior to construction or soil disturbances. By removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation. • Two aggressive category 1b species were recorded within the <i>Aloe arborescens-Clivia caulescens</i> cliff face vegetation. These species readily set seed and has already spread down towards the forests. These species should be removed by qualified persons such as the Working for Water High Altitude team that are trained in rappelling. • All alien seedlings and saplings must be removed as they become evident for the duration of construction. • All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction areas. This should be verified by the ECO. • If filling material is to be used, this should be sourced from areas free of invasive species. 		
Operational:		
<ul style="list-style-type: none"> • No alien and invasive plant species as listed on 18 September 2020 in the list of Alien Invasive Species published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 43726 of 2020) may be planted within the development. • Only use indigenous species naturally occurring <u>on the site</u> for rehabilitation or landscaping. No trees that are not natural to the Gods Window area may be planted at parking areas or the development landscape. Rather, the areas should be rehabilitated to the natural occurring vegetation. • Implement an alien invasive plant monitoring and management plan whereby the spread of alien and invasive plant species into the areas disturbed by the construction are regularly removed and re-infestation monitored. This plan should regularly be updated and be implemented for the entire operational phase of the development. • Remove alien invasive species from the Gods Window area as soon as they become apparent. 		
Cumulative impacts:		
<ul style="list-style-type: none"> • The area that the proposed development is situated in is already infested with alien invasive plant species. Therefore, if mitigation measures to limit and prevent the spread of alien species are not implemented, the cumulative impact could lead to remaining natural vegetation transformed by alien plant species. 		
Residual Risks:		
<ul style="list-style-type: none"> • Due to the high occurrence of alien invasive plant species in the area, the residual risk of increased alien vegetation cover is moderate to high. 		

6.3.5 Clearing of land for construction camps and potential pollution of the soil and water

Nature: These may be at one or several locations, area will be cleared and levelled where necessary, site offices may be temporary structures, machinery, building supplies and temporary staff facilities (excluding accommodation) will be housed here. The impacts could include:

- Removal of vegetation
- Levelling and compaction of soils
- Storage of machinery, supplies and staff facilities

This could lead to the loss of vegetation and/or species of conservation concern, alteration, and loss of microhabitats, altered vegetation cover, increased erosion and contamination of soil and groundwater.

	Without mitigation	With mitigation
CONSTRUCTION PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Medium-term (3)	Short-term (2)
Extent	Local Area (2)	Site bound (1)
Magnitude	Moderate (6)	Low (4)
Significance	33 (moderate)	14 (low)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Short-term (2)	Very short-term (1)
Extent	Local Area (2)	Site bound (1)
Magnitude	Moderate (6)	Low (4)
Significance	30 (Moderate)	12 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Not Applicable	Not Applicable
Can impacts be mitigated?	Reasonably	

Mitigation:

Construction:

- Keep the clearing of natural vegetation to a minimum and locate construction camps within transformed or modified areas.
- After the final layout has been approved, conduct a thorough footprint investigation to determine any protected plant species population location and size.
- Stay within demarcated temporary construction areas and strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas
- Prevent spillage of construction material and other pollutants, contain, and treat any spillages immediately, strictly prohibit any pollution/littering according to the relevant EMPr
- No open fires may be lit for cooking or any other purposes, unless in specifically designated and secured areas
- Facilities may not be used as staff accommodation
- No vehicles may be washed on the property, except in suitably designed and protected areas
- No vehicles may be serviced or repaired on the property, unless it is an emergency in which case adequate spillage containment must be implemented
- After construction remove all foreign material prior to starting the rehabilitation

<ul style="list-style-type: none"> The rehabilitation plan for all temporarily affected areas must aim to re-introduce species naturally occurring in the area. Monitor the establishment of invasive species and remove as soon as detected, whenever possible before regenerative material can be formed <p>Operational:</p> <ul style="list-style-type: none"> Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. Monitoring should continue for at least two years after construction is complete.
<p>Cumulative impacts:</p> <ul style="list-style-type: none"> If mitigation measures are not strictly implemented, erosion of the development area, contamination of ground water and the spread and establishment of invasive species can take place.
<p>Residual Risks:</p> <ul style="list-style-type: none"> Compaction on construction camps could result in altered topsoil characteristics and vegetation composition. These areas are also prone to invasion by alien invasive plant species.

6.3.6 Compaction and destruction of soils

<p>Nature: The movement of heavy machinery over vegetated areas during construction and maintenance will result in soil compaction that will modify habitats, destroy vegetation, and inhibit re-vegetation. Soil compaction because of vehicles and traffic, could lead to a decrease of water infiltration and an increase of water runoff. Such areas are more likely to be colonised by pioneer, alien invasive plant species, than indigenous species. This will further transform the vegetation of the area. The health of the topsoil is imperative for re-vegetation. Incorrect stripping, handling and storage could lead to failed rehabilitation.</p>		
	Without mitigation	With mitigation
CONSTRUCTION PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Long-term (4)	Short-term (2)
Extent	Local (2)	Site bound (1)
Magnitude	High (8)	Low (4)
Significance	56 (moderate)	14 (low)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Short term (2)	Short term (2)
Extent	Limited to Site (1)	Limited to the Site (1)
Magnitude	Moderate (4)	Minor (2)
Significance	21 (low)	10 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes	

<p>Mitigation:</p> <p>Construction:</p> <ul style="list-style-type: none"> • Vehicles and machinery may not veer from the dedicated roads. • Once construction is complete, obsolete roads should be obliterated by breaking the surface crust and erecting earth embankments to prevent erosion, while the natural species composition should be re-established. • Prior to construction, the topsoil must be removed and stored separately from subsoil. The topsoil is imperative for the successful re-establishment of indigenous vegetation and it carries seed from the existing vegetation • Topsoil (the upper 25 cm of soil) is an important natural resource; where it must and can be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil. • Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower, ideally in a disturbed but weed-free area. Place berms along contours or perpendicular to the prevailing wind direction. • Rapid decomposition of organic material in warm, moist topsoils decreases microbial activity necessary for nutrient cycling, and reduces the number of beneficial micro-organisms in the soil. Therefore, topsoil should therefore not be stored for extensive periods and it is recommended that the reapplication of topsoil takes place as soon as possible. Adhere to the following general rule: <i>the larger the pile of topsoil storage needs to be, the shorter should be the time it is stored</i> • Topsoil handling should be limited to stripping, piling (once), and re-application. • Any movement of heavy machinery or vehicles over stored topsoils must be strictly prohibited. <p>Operational:</p> <ul style="list-style-type: none"> • Maintenance / operational vehicles may not deviate from dedicated roads.
<p>Cumulative impacts:</p> <ul style="list-style-type: none"> • Failed rehabilitation and soil compaction associated with the development could lead to a cumulative invasion by alien invasion plant species from the surrounding transformed vegetation that can easily spread into the compacted soils.
<p>Residual Risks:</p> <ul style="list-style-type: none"> • Altered soil characteristics and vegetation that remain in an unstable, pioneer phase or invaded by alien invasive plant species.

6.3.7 Destruction of unique rocky habitats and trees

<p>Nature: Parts of the development falls on rocks that create the unique habitat, might be destroyed, or shifted. In addition, large trees might be removed, or the roots severed, which could result in diseases and trees toppling.</p>		
	Without mitigation	With mitigation
CONSTRUCTION PHASE		
Probability	Highly probable (4)	Probable (3)
Duration	Long term (4)	Short term (3)
Extent	Regional (3)	Limited to Site (1)
Magnitude	High (8)	Moderate (6)
Significance	60 (high)	30 (medium)

Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Improbable (2)	Very improbable (1)
Duration	Short term (2)	Short term (2)
Extent	Limited to Site (1)	Limited to the Site (1)
Magnitude	Moderate (6)	Low (4)
Significance	18 (low)	14 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes	
Mitigation:		
Planning:		
<ul style="list-style-type: none"> The planning layout must impact on as little vegetation as possible. The need to remove trees, shrubs and undergrowth must be limited. Workers must undergo environmental awareness training and understand the need to limit impacts on the natural environment. Do not remove large rocks or break boulders. Incorporate the rocks into planning of the development footprint. Do not remove large and unique trees along the footpaths, or orchids and other protected species. 		
Construction:		
<ul style="list-style-type: none"> Keep the development footprint and areas to be disturbed as small as possible. Prevent damage to trees and shrubs that are not directly within the development footprint. 		
Operational:		
<ul style="list-style-type: none"> Maintain clear footpaths to prevent random access of visitors over rocks where they could trample smaller vegetation. Monitor the survival of relocated species. 		
Cumulative impacts: None envisaged		
Residual Risks: Disturbances to the root area of trees could result in trees dying.		

6.3.8 Modification of the natural vegetation

Nature: Post construction, the vegetation within the development footprint might be landscaped and irrigated. This could change the species composition and abundance (or density) of the vegetation around the development footprint. Lush areas around the development could encourage a variety of birds to the area, which can spread seed of plant species not naturally occurring in the area.		
	Without mitigation	With mitigation
CONSTRUCTION PHASE		
Probability	Highly probable (4)	Probable (3)

Duration	Long-term (4)	Long-term (3)
Extent	Limited to Local Area (2)	Site (1)
Magnitude	Moderate (6)	Low (4)
Significance	48 (medium)	24 (low)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Probable (3)
Duration	Long term (3)	Long term (3)
Extent	Limited to Local Area (2)	Limited to the Site (1)
Magnitude	Moderate (6)	Low (4)
Significance	33 (medium)	24 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate to high
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes	
<p>Mitigation:</p> <p>Planning:</p> <ul style="list-style-type: none"> • Limit the need for rehabilitation and landscaping of vegetation. • The landscape plan should only make use of species naturally occurring within the Gods Window area • Irrigated areas should be kept to a minimum <p>Construction:</p> <ul style="list-style-type: none"> • Erect a temporary fence or demarcation around the construction area to prevent access to sensitive environs. • No random-access routes, equipment storage or construction camps may be situated in the watercourse. • Prevent the unnecessary removal and trampling of vegetation <p>Operational:</p> <ul style="list-style-type: none"> • No operational activities may directly impact on the vegetation of very high and high SEI, other than the proposed skywalk. • Rehabilitate areas that was disturbed with an indigenous species that naturally occur at Gods Window. • Manage the vegetation within the development footprint to maintain it in a natural to near-natural state. The area should not be irrigated. 		
<p>Cumulative impacts:</p> <ul style="list-style-type: none"> • Degradation of the vegetation around the development particularly from the cliff edge downwards. This will impact on the vegetation species composition and functionality. • Landscaping and irrigation of the vegetation within the development footprint could increase bird diversity, resulting in the establishment of plant species not naturally from the area on and around the site. 		
<p>Residual Risks: Operational activities may cause indirect impacts to the vegetation along the river, including pollution. This could result in a change in species composition and functionality. If mitigation measures are adequately undertaken, the residual risk is low as the impacts are unlikely to exceed the construction impacts.</p>		

6.3.9 Impact on ecological processes

Nature during construction and operation:		
<ul style="list-style-type: none"> As per the 2013 ecological and wetland report, the hydrology of the area seems interconnected and important in terms of regulating different moisture regimes in different areas, many areas serving as habitat harbouring a multitude of species of conservation concern (SEF, 2013 and 2014). These species are dependent on the wet conditions of some of the cliffs. The wet conditions of these cliffs are most probably caused by wetlands on the top of the escarpment, and it is therefore likely that disturbance caused to these wetlands will impact the water regimes on the vertical cliffs which will cause the moisture dependant species to die. Construction and operation could cut off the waterflow to plant species of conservation concern growing on the cliff edge and on the vertical cliff. The current layout destroys most of the <i>Passerina montana</i> -<i>Scleria transvaalensis</i> scrubveld. Fire in scrubveld maintain the species composition and vegetation structure. Fires will be prevented to safeguard infrastructure, which could result in a change of species composition. Mismanagement of the vegetation and lack of rehabilitation could lead to encroachment by non-herbaceous or 'woody' species such as the bracken fern (<i>Pteridium aquilinum</i>) and <i>Cliffortia linearifolia</i> which were already present in large numbers. This could change ecotonal communities, which can tolerate fire 		
	Without mitigation	With mitigation
CONSTRUCTION PHASE		
Probability	Definite (5)	Probable (3)
Duration	Permanent (5)	Long term (4)
Extent	Local area (2)	Local area (2)
Magnitude	Very High (10)	Moderate (6)
Significance	85 (high)	36 (medium)
OPERATIONAL PHASE		
Probability	Highly probable (4)	Probable (3)
Duration	Long term (4)	Medium term (3)
Extent	Local area (2)	Limited to site (1)
Magnitude	Very high (10)	Moderate (6)
Significance	64 (high)	30 (medium)
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	High	Moderate
Can impacts be mitigated?	In terms of hydrology, avoidance might be the only mitigation, except if the flow of water can be mimicked or preserved.	
Mitigation:		
Planning:		
<ul style="list-style-type: none"> Reduce the development footprint within the <i>Passerina montana</i> -<i>Scleria transvaalensis</i> scrubveld and position the development based on recommendations of the wetland and geo-hydrology assessments. Consider implementing the development in a phased approach. The impact of the development on the sensitive plant species on the vertical cliffs can not be entirely foreseen or envisaged as it has not been studied. A phased approach (e.g. parking, restaurant and Skybridge as Phase 1) could provide time to study 		

the impact of a smaller development prior to phase 2 of the development (skywalk and additions to the restaurant and visitors centre).

- Avoid the use of foundations where possible e.g., employ lightweight steel construction and stilts instead of digging foundations into the lateral waterflow.
- The development layout should be set back from the cliff edge to protect and conserve the *Aloe arborescens-Clivia caulescens* cliff face vegetation. This vegetation includes a Vulnerable species, a Near-Threatened species as well as a Data deficient species. A set back of a minimum of 15m from the cliff edge will protect the vegetation from edge effects. Only the skybridge may traverse this vegetation and the access to the skywalk.
- Follow planning mitigation as set out in 4.3.2

Construction:

- Leave as much natural vegetation intact as possible.
- Do not disturb soil unnecessarily.
- Ensure that areas outside of the operational footprint that were disturbed, are adequately rehabilitated and that dense stands of encroacher species are prevented.
- All construction materials including fuels and oil should be stored in a demarcated area that is contained within a bunded impermeable surface to avoid spread of any contamination (SEF, 2014).
- Emergency plans must be in place in case of spillages to prevent contaminants reaching preferential flow paths.
- Littering and contamination of water sources during construction must be mitigated by effective construction camp management.
- A fire management plan must be implemented for the duration of construction

Operation:

- Monitor the establishment of dense stands of encroacher species and remove or thin as soon as detected.
- A rehabilitation plan, using indigenous species from the study area, must be implemented that will restore disturbed areas beyond the footprint of the infrastructure to what it was prior to construction, thereby making the impact on the remainder of the site negligible in the long term.
- Develop a burning, cutting management plan with an ecologist which considers safety of the operation, local by-laws and national legislation, in order to effectively manage natural vegetation.
- Implement a fire management plan that safeguards visitors and infrastructure, while allowing natural fires to burn.

Cumulative impacts:

- Possible bush densification around the development footprint and loss of indigenous species diversity.
- Drying out of cliff faces and subsequent demise of plant species of conservation concern

Residual Risks:

- Drying out of cliff faces and subsequent demise of plant species of conservation concern.
- Unforeseen impacts

7. PROTOCOL SUMMARY

For ease of reference, the following table summaries results of the assessment as per the main requirements of the Protocols for Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial (Vegetation) Biodiversity as published on 20 March 2020.

Table 19: Summary of the main terrestrial (vegetation) biodiversity findings

Biodiversity (vegetation) aspect	Result
<p>Conservation Plan Category: Protected area (Figure 8)</p>	<p>Impact on the ecological processes:</p> <ul style="list-style-type: none"> • As per the 2013 ecological and wetland report, the hydrology of the area seems interconnected and important in terms of regulating different moisture regimes in different areas, many areas serving as habitat harbouring a multitude of species of conservation concern (SEF, 2013 and 2014). These species are dependent on the wet conditions of some of the cliffs. The wet conditions of these cliffs are most probably caused by wetlands on the top of the escarpment, and it is therefore likely that disturbance caused to these wetlands will impact the water regimes on the vertical cliffs which will cause the moisture dependant species to die. • Construction and operation could cut off the waterflow to plant species of conservation concern growing on the cliff edge and on the vertical cliff. • The layout destroys most of the <i>Passerina montana</i> -<i>Scleria transvaalensis</i> scrubveld. The vegetated roof proposes to reinstate an ecological corridor on the escarpment in a southerly and northerly direction and provides a "stepping stones" through the development. • Fire in scrubveld maintain the species composition and vegetation structure. Fires will be prevented to safeguard infrastructure, which could result in a change of species composition. • Mismanagement of the vegetation and lack of rehabilitation could lead to encroachment by non-herbaceous or 'woody' species such as the bracken fern (<i>Pteridium aquilinum</i>) and <i>Cliffortia linearifolia</i> which were already present in large numbers. This could change ecotonal communities, which can tolerate fire. <p>Main objectives of Protected Areas in relation to this proposed project:</p> <ul style="list-style-type: none"> • All protected areas exist primarily for the purpose of securing biodiversity and maintaining the ecological integrity of the landscapes in which they are situated. The Protected Areas Act (Act 57 of 2003) requires that land-use and management in each protected area is governed by a formally approved management plan. Such plans identify allowable activities and allocate them to appropriate zones within the protected area. The management plan for the Blyderiviers or Motlatse Canyon Provincial Nature Reserve was not available to the specialist at the time of writing this report. Where it is

Biodiversity (vegetation) aspect	Result
	<p>necessary to establish or expand infrastructure within a protected area, this should be carried out subject to the provisions of NEMA, the Protected Areas Act and its regulations. However, all operational aspects of managing protected areas are subject to their main purpose.</p> <ul style="list-style-type: none"> • Thus, in the case of Gods Window, the area must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.
Listed ecosystems	<ul style="list-style-type: none"> • According to the 2011 Listed Ecosystems, Gods Window falls within the Endangered Blyde Quartzite Grasslands. Although the National List of Threatened Terrestrial Ecosystems published in terms of the Biodiversity Act in 2011 remains in legal force, the data contained in the recent National Biodiversity Assessment (NBA) 2018 represents an update of the assessment of threat status for terrestrial ecosystems and classified the ecosystems that the site is situated in as Least Concern.
SWSA	<ul style="list-style-type: none"> • According to Le Maitre <i>et al.</i> (2018), the project is in the Mpumalanga Drakensberg & Northern Lowveld Escarpment Groundwater SWSA. Only 2.63% of this strategic water source is currently protected. Gods Window forms part of a protected area and is thus important to conserve the Mpumalanga Drakensberg & Northern Lowveld Escarpment Groundwater SWSA. • The hydrology of the area seems interconnected and important in terms of regulating different moisture regimes in different areas, many areas serving as habitat harbouring a multitude of species of conservation concern. Construction and operation will cut off the lateral waterflow to plant species of conservation concern growing on the cliff edge and on the vertical cliff. • Erosion and pollution caused by clearing of vegetation for the development, could impact on the downstream water quality temporarily (e.g. during construction).
NFEPA	See wetland assessment
Indigenous forest:	<ul style="list-style-type: none"> • The proposed development will destroy a portion (about 0.7ha) of degraded forest between the R534 road and the existing parking. • The upgrade of the footpaths will have an edge effect into the surrounding indigenous forest as well as habitat of plant species of conservation concern, including orchids. The extent of this impact is not known as the actual upgrade footprint was not provided. • The main development of the proposed project could have an indirect impact on indigenous forest below the cliff face. This could be caused by a change in hydrology, pollution and damage caused by falling objects.
No go areas	<ul style="list-style-type: none"> • <i>Aloe arborescens-Clivia caulescens</i> cliff vegetation

Biodiversity (vegetation) aspect	Result																					
	<ul style="list-style-type: none"> Vegetation on vertical cliffs may not be disturbed during construction of the skybridge and skywalk or allowed to dry out due to the development within the <i>Passerina montana-Scelria transvaalensis</i> scrubveld. Limit activities within the forest to the absolute minimum and prevent any indirect impacts to forests below the cliffs. 																					
<p>Plant species of conservation concern</p>	<ul style="list-style-type: none"> Ten (10) species of conservation concern were confirmed to occur. Appendix C gives more details on the possible size of populations and provides a map wherein confirmed localities, including those confirmed in 2013 by SEF, are geographically represented. <p>Number and threat status of confirmed and highly likely to occur species (see Appendix C for details)</p> <table border="1" data-bbox="505 772 1422 1171"> <thead> <tr> <th>Threat status</th> <th>Number of species confirmed to occur</th> <th>Number of species that has a medium to high possibility of occurrence.</th> </tr> </thead> <tbody> <tr> <td>Endangered</td> <td>-</td> <td>2</td> </tr> <tr> <td>Vulnerable</td> <td>3</td> <td>3</td> </tr> <tr> <td>Near Threatened</td> <td>2</td> <td>-</td> </tr> <tr> <td>Data deficient (taxonomic problems)</td> <td>1</td> <td>-</td> </tr> <tr> <td>Rare</td> <td>4</td> <td>2</td> </tr> <tr> <td>Total</td> <td>10</td> <td>7</td> </tr> </tbody> </table> <p>Note the following:</p> <ul style="list-style-type: none"> Inaccessible areas were not sampled; however, the areas that will directly be impacted on by the skywalk and skybridge must be assessed to verify the species of concern, and the number of each, that will be directly impacted on the cliff face. This will involve abseiling along the final locality and anchor points of the skywalk and -bridge. The exact footprint of the upgrade of the footpaths must be provided to the specialist to assess the number of species of conservation concern, as well as national protected species, that will be impacted thereby. Some orchid species were not in flower and the species need to be confirmed in the flowering period. The pipeline route and locality of the Prestressed Steel Tank must be walked and all protected tree and plant species that will be affected must be marked for permit application purposes. 	Threat status	Number of species confirmed to occur	Number of species that has a medium to high possibility of occurrence.	Endangered	-	2	Vulnerable	3	3	Near Threatened	2	-	Data deficient (taxonomic problems)	1	-	Rare	4	2	Total	10	7
Threat status	Number of species confirmed to occur	Number of species that has a medium to high possibility of occurrence.																				
Endangered	-	2																				
Vulnerable	3	3																				
Near Threatened	2	-																				
Data deficient (taxonomic problems)	1	-																				
Rare	4	2																				
Total	10	7																				
<p>Direct impacts:</p>	<p>The main impacts expected are as follows:</p> <ul style="list-style-type: none"> Destruction of the <i>Passerina montana-Scleria transvaalensis</i> scrubveld. The current layout destroys the entire <i>Passerina montana -Scleria transvaalensis</i> 																					

Biodiversity (vegetation) aspect	Result
	<p>scrubveld (Figure 20). The development layout blocks any ecological corridors on the escarpment in a southerly and northerly direction and provides no "stepping stones" through the development. The original design in 2013 was smaller and humbly positioned with options to conserve portions of <i>Passerina montana</i> -<i>Scleria transvaalensis</i> scrubveld on either side of the development, including movement corridors (compare Figures 19, 20 and 21).</p> <ul style="list-style-type: none"> • Destruction of the <i>Aloe arborescens</i>-<i>Clivia caulescens</i> cliff edge vegetation and sensitive plant species. • Destruction of sensitive plant species on the vertical cliff (several threatened species can be impacted on). • Falling objects impacting on the sensitive vegetation along and below the cliff. • Damage to forest vegetation and sensitive species along the Prestressed Steel Tank pipeline and at the tank locality. • Introduction of alien invasive plant species to the area and lead to an increase of the invasive species already present.
Indirect impacts	<ul style="list-style-type: none"> • Change in hydrology: if the scrubveld is developed it will impact the water regime / available water for vegetation on the cliff's edge, on the cliff, as well as the forest below. • Overshadowing of the vegetation on the cliff face by the skywalk and skybridge. • These structures could also have a rain shadow effect, or concentrate runoff along the cliff face, destroying vegetation in crevices. • Falling objects impacting on the sensitive vegetation along and below the cliff (e.g. litter). • Introduction of alien invasive plant species to the area, either as planted ornamentals or via visitors. • Polluted water or piped water discharging into surrounding vegetation. • Modification of natural vegetation: the vegetation within the development footprint might be landscaped and irrigated (including the sue of species not naturally occurring in the area). This could change the species composition and abundance (or density) of the vegetation around the development footprint.
Cumulative impacts:	<ul style="list-style-type: none"> • Potential future expansion of the development • This will increase fragmentation within narrow patches of natural to near-natural vegetation. • Degradation of the vegetation around the development particularly from the cliff edge downwards. This will impact on the vegetation species composition and functionality.

Biodiversity (vegetation) aspect	Result
	<ul style="list-style-type: none"> Landscaping and irrigation of the vegetation within the development footprint could increase bird diversity, resulting in the establishment of plant species not naturally from the area.
Residual impacts:	<ul style="list-style-type: none"> Species removed and relocated as part of rehabilitation could die due to transplantation shock or damage during replanting. Degradation of vegetation along the vertical cliffs and the forests below. Change in ecological processes. Increase in alien invasive vegetation. Unforeseen impacts.

8. CONCLUSION

The project area is situated within a protected area and comprise mainly of natural vegetation. The proposed project will impact on vegetation ranging from a medium to a very high sensitivity. The vegetation further includes sensitive and unique habitats, and several plant species of conservation concern were confirmed to occur or are highly likely to be present. The proposed project activities that will impact on areas of very high sensitivity will have an impact on sensitive vegetation which is difficult, if not impossible, to rehabilitate. Some impacts can be mitigated; however, some can not and the feasibility of the project, compared to conservation of sensitive plant species must be considered.

The following is recommended to limit the foreseen impacts:

- Reduce the development footprint within the *Passerina montana* -*Scleria transvaalensis* scrubveld (medium sensitivity) and position the development based on recommendations of the wetland and geo-hydrology assessments. This will allow the persistence of this vegetation, while safeguarding the groundwater source that the species on the cliff face is likely dependent on.
- Reconsider the need for a skywalk compared to the need to conserve sensitive plant species. If the skywalk is developed, as best practise, the skybridge should be limited in its extent and thus resulting impacts.
- Consider implementing the development in a phased approach. The impact of the development on the sensitive plant species on the vertical cliffs can not be entirely foreseen or envisaged as it has not been studied, the geohydrology assessment could assist in determining the impact. A phased approach (e.g., parking, restaurant and Skywalk as Phase 1) could provide time to study the impact of the smaller development prior to phase 2 of the development (skybridge and additions to the restaurant and visitors centre).
- Avoid the use of foundations were possible, e.g., employ lightweight steel construction and stilts instead of digging foundations into the lateral waterflow.

- The development layout should be set back from the cliff edge to protect and conserve the *Aloe arborescens-Clivia caulescens* cliff face vegetation. This vegetation includes a Vulnerable species, a Near-Threatened species as well as a Data deficient species. A setback of a minimum of 15m from the cliff edge will protect the vegetation from edge effects. Only the skybridge may traverse this vegetation and the access to the skywalk.

The findings of this specialist assessment caution against a development layout that will destroy the entire *Passerina montana -Scleria transvaalensis* scrubveld, which in turn will result in a (yet ill-understood) impact on the very sensitive vegetation on the cliff face.

9. REFERENCES

- Bromilow, C, (2010): Problem Plants of Southern Africa. Third edition, first impression Briza Publications, Pretoria.
- Department of Environmental Affairs (DEA), (2011): National Environmental Management: Biodiversity Act (Act 10 of 2004). National List of Ecosystems that are threatened and in need of protection. Government Gazette (34809).
- Department of Environmental Affairs (DEA), (2019): Towards a policy on indigenous bush encroachment in South Africa. Department of Environmental Affairs, Pretoria, South Africa
- Department of Water Affairs and Forestry, (2005): Environmental Best Practice Specifications: Construction for Construction Sites, Infrastructure Upgrades and Maintenance Works. Version 3
- Germishuizen, G., Meyer, N.L., Steenkamp, Y. & Keith, M. (Eds) (2006): A Checklist of South African Plants. South African National Botanical Diversity Network Report 41. Sabonet, Pretoria.
- Golding, J.S. (ed), (2002): South African plant red data list. Southern African Botanical Diversity Network (SABONET) Rep. No.14
- Henderson, L., (2001): Alien Weeds and Invasive Plants. A complete guide to declared weeds and invaders in South Africa. Plant Protection Research Institute Handbook No. 12. Agricultural Research Council, South Africa.
- Kent, M. and Coker, P. (1992): Vegetation description and analysis: a practical approach. CRC Press
- Low, A.B. & Robello, A.G. (1996): Vegetation of South. Africa, Lesotho and Swaziland. Pretoria. Department. of Environmental Affairs and Tourism, South Africa
- McMurtry, D., Grobler, L., Grobler, J. and Burns, S., (2008): Field guide to the Orchids of Northern South Africa and Swaziland. Umdaus Press. Hatfield, Pretoria
- Mpumalanga Tourism and Parks Agency (MTPA), (2008): Requirements for assessing and mitigating environmental impacts of development applications.

- Mpumalanga Tourism and Parks Agency (MTPA), (2014): Mpumalanga Biodiversity Sector Plan Handbook. Compiled by Lötter M.C., Cadman, M.J. and Lechmere-Oertel R.G.
- Mpumalanga Tourism & Parks Agency (MTPA), (2020): Species Status Report for the site. Received from Mervyn Lotter.
- Mucina, L. & Rutherford, M.C. (2006): The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19. South African National Biodiversity Institute*, Pretoria.
- Onderstall, J. (1996): Sappi Wild Flower Guide: Mpumalanga and Northern Province.
- Perlman, D.L., and Milder, J.C. (2005): Practical ecology for planners, developers and citizens. Island Press, Washington.
- Pooley, E., (1998): *Guide to the Wildflowers of Kwazulu Natal and the Eastern Region*. Natal Flora Publications, Durban.
- Raimondo, D., von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A. & Manyama P.A., (eds) (2009): Red List of South African plants 2009. *Strelitzia 25*, South African National Biodiversity Institute.
- Schmidt, E., Lotter, M. and McClelland W. (2002): Trees and Shrubs of Mpumalanga and Kruger National Park. Jacana Publishing.
- Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.): (2019): South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria. <http://hdl.handle.net/20.500.12143/6370>
- South African National Biodiversity Institute (SANBI).(2020): Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.0.
- SANBI, (2016): Lexicon of Biodiversity Planning in South Africa. Beta Version, June 2016. South African National Biodiversity Institute, Pretoria. 72 pp.
- Strategic Environmental Focus, (2013): Gods Window Skywalk: Ecological Assessment. Reported drafted to Industrial Development Corporation (IDC) (applying on behalf of MTPA). November 2013. SEF project number: 505201
- Strategic Environmental Focus, (2014): Gods Window Skywalk: Wetland Assessment. Reported drafted to Industrial Development Corporation (IDC) (applying on behalf of MTPA). November 2013. SEF project number: 505201
- Van Oudtshoorn, F., (2004): *A Guide to Grasses of Southern Africa*. Briza Publications,
- Van Wyk, B. and Malan, S. (1997): *Field Guide to the Wild Flowers of the Highveld*. Struik Publishers. Cape Town.

Van Wyk, B., Van Oudshoorn B., & Gericke N., (2005): Medicinal Plant of South Africa. Briza Publications, Pretoria.

Williamson, S. D., (2016): Endemism, diversity and priorities for the conservation of serpentine areas in the Barberton Greenstone Belt, Mpumalanga, South Africa. A Thesis submitted to the Faculty of Science, University of the Witwatersrand, in fulfilment of the requirement for the degree of Doctor of Philosophy. Johannesburg March 2016. <http://wiredspace.wits.ac.za/handle/10539/21069>

Zutari (Pty) Ltd, (2022): Gods Window Skywalk Roof Vegetation & Wildfire Risks - Rational Fire Design Report. Reference: 1001604. Revision:0. Submission date: 2022/05/09

10. GLOSSARY

Alien species	Plant taxa in a given area, whose presence there, is due to the intentional or accidental introduction as a result of human activity
Conservation concern (Plants of..)	Plants of conservation concern are those plants that are important for South Africa's conservation decision making processes and include all plants that are Threatened (see Threatened), Extinct in the wild, Data deficient, Near threatened , Critically rare, Rare and Declining . These plants are nationally protected by the National Environmental Management: Biodiversity Act. Within the context of these reports, plants that are provincially protected are also discussed under this heading.
Conservation status	An indicator of the likelihood of that species remaining <u>extant</u> either in the present day or the near future. Many factors are taken into account when assessing the conservation status of a species: not simply the number remaining, but the overall increase or decrease in the population over time, breeding success rates, known threats, and so on.
Critically Endangered	A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
Data Deficient	There is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. However, "data deficient" is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.
Declining	A taxon is declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Threatened or Near Threatened, but there are threatening processes causing a continuous decline in the population (Raimondo <i>et al</i> , 2009).
Edge effect	Inappropriate influences from surrounding activities, which physically degrade habitat, endanger resident biota and reduce the functional size of remnant fragments including, for example, the effects of invasive plant and animal species, physical damage and soil compaction caused through trampling and harvesting, abiotic habitat alterations and pollution
Endangered	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future
Exotic species	Plant taxa in a given area, whose presence there, is due to the intentional or accidental introduction as a result of human activity

Forb	A herbaceous plant other than grasses.
Indigenous	Any species of plant, shrub or tree that occurs naturally in South Africa
Invasive species	Naturalised alien plants that have the ability to reproduce, often in large numbers. Aggressive invaders can spread and invade large areas
Irreversibly modified	An ecological condition class in which the ecosystem has been modified completely, with an almost complete loss of composition and structure. All or most ecosystem function has been destroyed and the changes are irreversible. Can apply to a site or an ecosystem.
Mitigation	The implementation of practical measures to reduce adverse impacts
Moderately modified	An ecological condition class in which ecological function is predominantly unchanged even though composition and structure have been compromised. Equates to a fair ecological condition or semi-natural
Natural	Unmodified. No significant changes in composition, structure or function have taken place. Good ecological condition.
Near Natural	Small changes in composition and structure may have taken place, but ecosystem functions are essentially unchanged. Good ecological condition
Near Threatened	A Taxon is Near Threatened when available evidence indicates that that it nearly meets any of the five IUCN criteria for Vulnerable and is therefore likely to qualify for a threatened category in the near future (Raimondo <i>et al</i> , 2009).
Protected Plant	According to Provincial Nature Conservation Ordinances or Acts, no one is allowed to sell, buy, transport, or remove this plant without a permit from the responsible authority. These plants are protected by provincial legislation.
Red Data	A list of species, fauna and flora that require environmental protection - based on the IUCN definitions. <i>Now termed Plants of Conservation Concern</i>
Semi-natural	Ecological function is predominantly unchanged even though composition and structure have been compromised. Fair ecological condition
Severely modified	An ecological condition class in which loss of composition, structure and ecological function is extensive. The land is in a poor ecological condition.
Species diversity	A measure of the number and relative abundance of species

Species richness	The number of species in an area or habitat
Threatened	Threatened Species are those that are facing a high risk of extinction, indicated by placing in the categories Critically Endangered (CR), Endangered (E) and Vulnerable (VU) (Raimondo <i>et al</i> , 2009)
Transformation	The removal or radical disturbance of natural vegetation, for example by crop agriculture, plantation forestry, mining or urban development. Transformation mostly results in a serious and permanent loss of biodiversity and fragmentation of ecosystems, which in turn lead to the failure of ecological processes. Remnants of biodiversity may survive in transformed landscapes
Vegetation Unit	A complex of plant communities ecologically and historically (both in spatial and temporal terms) occupying habitat complexes at the landscape scale. Mucina and Rutherford (2006) state: "Our vegetation units are the obvious vegetation complexes that share some general ecological properties such as position on major ecological gradients and nutrient levels, and appear similar in vegetation structure and especially floristic composition".
Vulnerable	A taxon is Vulnerable when it is not Critically Endangered or Endangered but meets any of the five IUCN criteria for Vulnerable and are therefore facing a high risk of extinction in the wild in the future (Raimondo <i>et al</i> , 2009)

APPENDIX A: SAMPLED AREAS AND TRANSECTS

The following Figures show the sample positions and tracks from 1-3 March 2022.

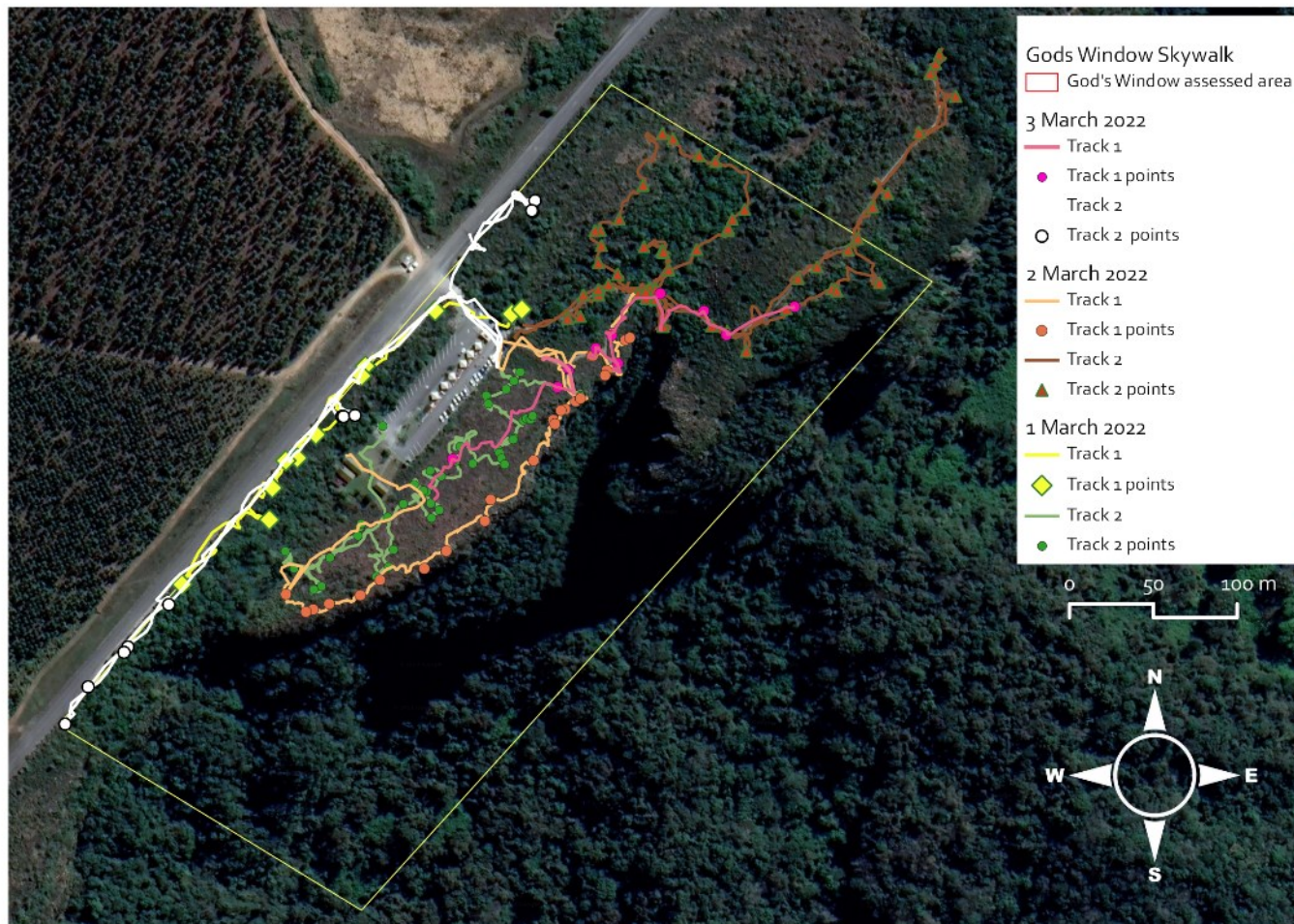


Figure 24: Sample points and tracks

APPENDIX B: SPECIES RECORDED DURING THE FIELD SURVEY

1 = species recorded in broad vegetation group

M = Medicinal

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens s cliff edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
Trees								
<i>Acalypha glabrata</i>	Forest false-nettle	Forest and bushveld		1				
<i>Aeschynomene rehmannii</i>		Grassland, rocky slopes	1	1				
<i>Bowkeria cymosa</i>	Escarpment shellflower	Moist places on hill slopes, in mountain grassland and the edges of subtropical forest,					1	
<i>Cassinopsis ilicifolia</i>	Lemon thorn	Montane forest, on forest margins, in wooded kloofs in riverine bush and along streams					1	
<i>Cliffortia nitidula</i>		Mistbelt grassland at high altitudes, along drainage areas	1	1			1	
<i>Cliffortia serpyllifolia</i>	Pompon rice bush	Stream banks in mistbelt grassland above 1600m		1				
<i>Cryptocarya transvaalensis</i>	Mountain Wild-Quince	Forest (Afromontane forests)					1	
<i>Cussonia spicata (M)</i>	Common Cabbage tree	Rocky outcrops, wooded grassland, mountain sides			1	1	1	

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Faurea cf galpinii</i> (Northern sourveld endemic)	Escarpment Beechwood	Ridges, protected vallyes				1		
<i>Greyia sutherlandii</i>	Natal Bottlebrush	Montane grassland, often in rocky places and associated with forest patches				1		
<i>Halleria lucida</i>	Tree fucshia	Along kloofs and streams						1
<i>Heteromorpha arborescens var abyssinica</i>	Peeling-bark Parsley tree	Forest margins, along streams and bushveld		1				1
<i>Hippobromus pauciflorus (M)</i>	False Horsewood	Forest margins, bushveld, scrub, rocky outcrops and riverine vegetation						1
<i>Kiggelaria africana</i>	Wild Peach	Forests, wooded ravines or on rocky outcrops in grassland						1
<i>Leocosidea sericea</i>	Oldwood	In kloofs and along streams. Disturbed areas		1				
<i>Myrsine africana</i>	Cape Myrtle	Forest margins, bush clumps, usually in shady situations				1		1
<i>Morella pilulifera</i>	Broad-leaved Waxberry.	Forests fringes, on mountain slopes, open grasslands, kloofs (steep-sided, wooded ravines or valleys) stream banks and in high attitude forests. It is common among rocks				1		1
<i>Obetia tenax</i>								1
<i>Ochna cf arborea</i>		Forests and forest margins						1

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens s cliff edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Oxyanthus speciosus</i>	Whipstick loquat	Understorey of evergreen forest					1	
<i>Peddiea africana</i>	Poison olive	Forest, forest margins, deep sahde					1	
<i>Podocarpus latifolius</i>	Real yellowwood	Mountainous areas and forests, also found on rocky hillsides and mountain slopes			1	1	1	
<i>Psydrax obovata</i>							1	
<i>Psychotria capensis</i>	yellow-flower bird berry	Understorey of evergreen montane forests, forest margins, , rocky outcrops in montane grassland					1	
<i>Rapanea melanophloeos (P)</i>	Cape Beech	Coastal, swamp and mountain forest, forest margins and bush clumps					1	
<i>Rawsonia lucida</i>	Forest peach	Forsts, usually understorey					1	
<i>Robsonodendron eucleiforme</i>	Silky bark	Forest					1	
<i>Schrebera alata</i>	Wing-leaved wooden-pear	Edges of mistbelt forest, bushveld on rocky wooded hillsides					1	
<i>Scolopia mundii</i>	Red pear	Forest and forest margin habitats, and rocky outcrops on grassy mountain slopes,					1	
<i>Searsia chirensensis</i>	Red Currant	Forest, forest margins, riverine bush and rocky hillsides					1	
<i>Searsia tumulicola</i>	Hard-leaf Currant	At high altitude in evergreen forests or forest margins. Also grow on grasslands,	1		1		1	

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S	transvaale	C linearifolia -S species			
		in moist areas and on rocky mountainsides						
<i>Syzigium gerrardii</i>	Forest Waterberry	Mistbelt forest						1
<i>Trimeria grandiflora</i>	Wild mulberry	Forest and forest margins						1
<i>Xymalos monospora</i>	Lemonwood	Moist, often degraded, Afromontane forest along the escarpment						1
Number of indigenous tree species recorded = 34			3	6	7	2	28	
Grasses								
<i>Brachypodium flexum</i>		Forests, moist areas						1
<i>Cynodon dactylon</i>	Couch grass	Most soils, usually in disturbed areas. Increaser II grass, palatable	1	1				
<i>Loudetia simplex</i>	common russet grass	Open grassland, poor sandy soil to rocky slopes and vlei's. Increaser II	1					
<i>Melinis nerviglumis</i>	Bristle-leaved Red Top	Undisturbed grassland, rocky slopes and soils.	1	1				
<i>Panicum ecklonii</i>	Small Panicum	Sour grassland, mainly moist position against slopes	1	1				
<i>Paspalum dilatatum</i>	Dallis Grass	Introduced grass, moist areas in vlei's and close to rivers. Sometimes planted for pasture	1					1
<i>Pentaschistis natalensis</i>		Mountainous areas, grassland, forest edges	1	1				

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Prospytochloa prehensis</i>		Forests					1	
<i>Setaria lindenbergia</i>	Mountain bristle grass	Rocky areas, shade			1		1	
<i>Setaria megaphylla</i>	Broad-leafed bristle grass	Along rivers in low-lying areas or forests and in dense bushveld where there is plenty of moisture					1	
Minimum number of indigenous grass species = 10			6	4	1	0	5	
Climbers								
<i>Clematis brahiata</i>	Traveller's Joy	Bushy hillsides, particularly rocky places		1	1			
<i>Coccinia adoensis</i>		Bushveld, wooded areas in grassland. Climbing into shrubs and trees		1			1	
<i>Momordica balsamina</i>	laloentjie	Sandy, often disturbed places					1	
<i>Senecio tamoides</i>	canary Creeper	Forest margins Planted in gardens					1	
<i>Secamone alpini</i>	Monkey rope						1	
Number of climbers recorded = 5			0	2	1	0	4	
Small shrubs / Forbs / succulents								
<i>Agapahtnus inapertus (Pp)</i>	Drooping Agapanthus	Open grassland, forest margins	1	1	1		1	
<i>Aloe arborescens (P)</i>	Krantz Aloe	Mountainous areas	1		1	1		
<i>Aloe nubigena (P)</i>		Rocky grassland			1	1		
<i>Anisopappus smutsii</i>		Grassland						

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens s cliff edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Begonia sonderiana</i>	Wilde begonia	Cliffs, rocks in forest, rocky outcrops in grassland		1			1	
<i>Berkheya montana</i>				1			1	
<i>Brownleea coerulea</i> (iNat)		Forest floor					1	
<i>Buddleja salvifolia</i>	Sagewood	Along streams		1	1		1	
<i>Cliffortia linearifolia</i>	River Rice-bush		1	1				
<i>Coleus bojeri</i>		Grassland, woodland, open rocky areas, forest clearings, disturbed ground;	1		1		1	
<i>Coleus calycinus</i> / <i>Rabdosiella calycina</i>	Upland Flybush	Grassland	1	1				
<i>Commelina africana</i>		Widespread	1	1	1			
<i>Conostomium natalense</i>		Grassland	1		1			
<i>Crassula setulosa</i>		Rocky ridges, usually in rock crevices, often in exposed positions.	1					
<i>Crassula pellucida</i>		Grassland, moist areas, forest margins, rock	1					
<i>Crassula vaginata</i>	Yellow / White Crassula	Moist grassland	1		1			
<i>Craterocapsa tarsodes</i> (iNat)		Shallow soil, rocks	1					

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S	transvaale	C linearifolia -S species			
<i>Crocoshia mathewsiana</i> (Vu)		Damp, shady places along streams and forest margins.					1	
<i>Cyanotis lapidosa</i>		Open grassland and rocky forest margins	1					
<i>Dioscorea cotinifolia</i>	Wild yam	Rocky woodland					1	
<i>Disperis fanniniae</i> (iNat)(Pp)		Forest floor					1	
<i>Drimia elata</i> (DDT)	Satin squill	Grassland	1			1		
<i>Eulophia angloensis</i> (Pp)		Vlei's, boggy grassland, along streams or seepages	1					
<i>Euryops pedunculatus</i>						1		
<i>Galopina sp</i>		Forst margins	1				1	
<i>Habenaria cf galpinii</i> (Pp)		Shallow, wet, humus over rocky sheets. Damp grassland	1					
<i>Habenaria malacophylla</i> (Pp)	soft ghost orchid	Evergreen forest or montane forest patches in leaf litter					1	
<i>Helichrysum acutatum</i>	Sticky everlasting	Exposed grassland with rocky outcrops.	1	1				
<i>Helichrysum splendidum</i> (M)	Geelsewejaartjie	Rocky places	1	1				
<i>Helichrysum wilmsii</i>	Wilm's Everlasting	Grassland, rocky outcrops	1	1				
<i>Hemizygia cf albiflora</i>		Grassland, rocky	1	1				

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Hypericum revolutum</i>	Currybush	Cool and damp areas, growing along stream banks and at the edges of forests.	1	1			1	
<i>Impatiens sylvicola</i>	Transvaal balsam	Forest clearings and undergrowth, where it may form colonies in shady, humid places or along water courses			1		1	
<i>Ledebouria cf minima</i>		Moist grassland	1					
<i>Lobelia flaccida</i>	Wild Lobelia	Grassland, usually in moist areas.	1					
<i>Merwillia plumbea</i> (NT)(iNat)	Blue Squill	Sunny slopes, rocky hills, cliffs and ledges, to damp cliff faces, near waterfalls, in moist depressions, on the edges of streams and vleis (wetlands) to coastal areas,				1		
<i>Monopsis kowynensis</i> (Vu) (iNat) (SEF, 2013)		Forest margins in mistbelt grassland			1	1	1	
<i>Otiophora cupheoides</i>		Grassland	1					
<i>Passerina montana</i>	Mountai gonna	Along streams, montain grassland, forest edges or rocky outcrops	1	1				
<i>Pavonia columella</i>	Pink Pavonia	Forest margins, disturbed rich soils					1	
<i>Phymaspermum acerosum</i>		forest margins and in grassland	1	1				
<i>Plectranthus rubrupuntatus</i>		Rocky areas, grassalnd	1	1				

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Polystachya transvaalensis</i> (Pp) (iNat) (SEF, 2013)		In mist-belt evergreen forest					1	
<i>Psammotropha myriantha</i>		Grassland, often in rocky places	1					
<i>Psoralea latifolia</i>		Lowland fynbos, streambanks, forest margins		1	1			
<i>Schistostephium rotundifolium</i>		Forest margins, coastal dunes and scrub	1	1			1	
<i>Schizochilus lilacinus</i> (Pp) rare		Cliff faces				1		
<i>Sebaea sedoides</i>	Stone crop	Damp grassland			1			
<i>Senecio coronatus</i> (M)	Woolly Grassland Senecio / Sybossie	Grassland usually in large colonies	1					
<i>Seripheum species A</i> (Schmidt et al, 2002)	Zig-zag bush	Moist montane grassland and forest margins	1	1				
<i>Stenoglottis fimbriata</i> (Pp)		Forests and patches of bush surrounding rocks, found growing on rocks, and epiphytically on moss-covered tree trunk					1	
<i>Streptocarpus decipiens</i> (Rare) (SEF, 2013)							1	
<i>Streptocarpus wilmsii</i>		Forest floor					1	

Species	Common name	Habitat notes	Scrubveld		Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species			
<i>Streptocarpus fenestra-dei</i> (Vu)							1
<i>Tephrosia polystachya</i>	Pioneer Teprosia	Shady places, forest margins		1			
<i>Tetraselago natalensis</i>		Grassland	1	1			
<i>Wahlenbergia sp</i>			1				
Minimum number of indigenous forb species recorded = 58			33	20	14	5	21
Sedges							
<i>Carex spicata-paniculata</i>		Forest, forest edges, woodland; also in more open habitats in higher rainfall areas	1				
<i>Cyperus albostriatus</i>		White striped sedge	1				
<i>Cyperus congestus</i>		Depressions in grassland, damp and temporary wet areas, ditches					1
<i>Cyperus cf digitatus</i>		In or near water in swamps or seasonally flooded areas, river banks or along ditches.	1				
<i>Cyperus esculentus</i>		Weedy exotic in marshy or ploughed areas	1				1
<i>Cyperus rotundus subsp rotundus</i>	Purple nut-sedge	Moist areas, weedy in cultivated areas					1

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Cyperus rupestris var rupestris</i>		Rocky sheets or edges of pools	1					
<i>Scleria transvaalensis</i>		Seasonally damp, open to shady positions	1	1	1			
Number of sedge species recorded= 8			6	1	1	0	3	
Ferns and mosses								
<i>Alsophila capensis</i> (Cyathea)	Forest tree fern	Mistbelt forest						1
<i>Alsophila dregei</i> (Cyathea)	Grassland tree fern	Moist streambanks, along drainage lines in montane grassland, occasionally in forest margins, and among boulders and at the base of cliffs.			1	1	1	1
<i>Asplenium aethiopicum</i>		Wide variety of habitats, deciduous woodland, high altitude mist forest, riverine forest, evergreen coastal forest. Terrestrial, epiphytic or lithophytic.	1					1
<i>Blechnum punctulatum</i>		Shaded forest floor, boulders along mountain streams in scrub or along moist forest margins		1				1
<i>Cheilanthes cf hirta</i> (P)	Lip Fern	Between rocks	1					
<i>Cheilanthes cf viridis var viridis</i>		Forest floors, could also adapt to exposed situations amongst rocks or in drier deciduous woodland	1					1

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Dicranopteris linearis</i> (SEF, 2013)						1		
<i>Lycopodium clavatum</i> (iNat)	Stag's-horn Clubmoss					1		
<i>Pellaea calomelanos</i> (P)	Hard Fern	Grassland, often in moist or rocky places.	1					
<i>Pleopeltis macrocarpa</i> (iNat)	Bigfruit Scaly Polypody							
<i>Pteridium aquilinum</i>	Bracken Fern	Indigenopus, pest in damp places and encroach into grasslands	1	1		1		
<i>Sellaginella dregei</i>	Resurrection Selaginella	Forms mats on granite outcrops, in full sun.	1			1		
<i>Usnea species</i>	Old man's beard					1	1	1
Number of ferns and mosses = 14			6	2		6	2	6
Alien / Invasive Species								
<i>Acacia melanoxylon</i>	Blackwood	Category 2		1				1
<i>Acacia dealbata/decurrens*</i>	Wattle	Invader of grassland and riverbanks, Category 2		1				1
<i>Canna indica</i>	Garden canna	Category 1b	1					
<i>Coix lacryma-jobi</i>	Job's tears	Wet marshy areas, naturalised	1					
<i>Lilium formasanum</i>	St Joseph lily	Category 1b	1	1				1
<i>Pinus patula</i>	Patula Pine / Treurden	Category 2, transform landscape and reduce carrying capacity		1				1

Species	Common name	Habitat notes	Scrubveld			Aloe arborescens-C caulenscens clif edge	Vertical cliffs	Forests
			P montana -S transvaale	C linearifolia -S species				
<i>Rubus cuneifolius</i>	American bramble	category 1b	1	1	1		1	
<i>Solanum mauritianum</i>	Bugweed	Category 1b	1	1	1		1	
<i>Solanum pseudocapsicum</i>	Jerusalem Cherry	Category 1b, shady moist areas					1	
<i>Verbena bonariensis</i>	Wild Verbena	Category 1b (NEMBA)	1				1	
<i>Phytolacca octandra</i>	Inkberry	Category 1, proposed category 1B			1			
Number of alien and invasive species recorded= 11			6	6	3	0	8	
Minimum indigenous species per vegetation group			54	35	30	9	67	

APPENDIX C: (THIS APPENDIX IS CONFIDENTIAL -NOT FOR PUBLICATION)

Figure 25: Localities of plant species of conservation concern Note these are the minimum localities which was recorded in walked transects or sampled areas. More individuals are likely present. Ferns were abundant through out the project area of interest and not mapped

APPENDIX D: SPECIALIST QUALIFICATIONS

Curriculum Vitae Antoinette Eyssell-Knox

Personal Information Summary

Name: Antoinette Eyssell-Knox
Highest qualification: MSc Environmental Science (2010), University of Pretoria
Professional membership: SACNASP Pr Sci Nat (400019/11) Ecological Science
Company: Dimela Eco Consulting
Contact details: Antoinette@dimela-eco.co.za
Tel 083 642 6295

Professional Experience

- Environmental Management:

I have been working in the field of environmental management as a vegetation specialist since the year 2007 (11 years). I have been self-employed since November 2011.

Nov 2011 – current: Dimela Eco Consulting
Sep 2007 – Nov 2011: Strategic Environmental Focus (SEF)

Main field of work and experience include:

- Vegetation assessments, overviews or scans;
- Strategic ecological assessments;
- Ecological management, rehabilitation- and biodiversity action plans (including alien vegetation management);
- Specialist input: Gauteng and North-West Outlook Reports, ecological conditional requirements for Green Star rating;
- Ground-truthing of vegetation related data;
- Review of ecological reports; and
- Mentoring.

- Environmental Education:

2011 – current: Writer of the ecology feature for the bimonthly Supernova Kids Magazine
Aug 2003 – Sep 2007: Snr Environmental Education Officer, South African National Biodiversity Institute (SANBI), Pretoria National Botanical Garden

- Horticulture

Jun – Jul 2003: Horticultural Trainer, 7 Shaft Training Centre, Johannesburg
May 1997 – Mar 2002: Horticulturist, Pretoria National Botanical Garden (then NBI, now SANBI)

Qualifications

- M.Sc Environmental Science, University of Pretoria (2010)
Dissertation: *Land cover change and its effect on future land uses*
- B. Sc (Hons) Horticulture, University of Pretoria (1999-2000)
Dissertation: *Horticultural uses of the indigenous Barleria species*
- B. Sc (Agriculture) Horticulture, University of Pretoria (1993-1996)

Memberships and Affiliations

- SACNASP: Registered as a Professional Natural Scientist in the field of ecology since 2011 (Reg no 400019/11)
- Botsoc: Member of the Botanical Society of Southern Africa since 2013

Course History

- 2018: Asteraceae Identification Course
- 2015: SAGIC Invasive Species Consultant Training
- 2012: Tools for Wetland Assessment (Rhodes University – September 2012)
- 2012: Landscape Functional Assessment, introductory workshop with David Tongway and Prof Klaus Kellner (North West University)
- 2012: Soil Classification and Wetland Delineation (Terra Soil)
- 2007: ISO 14000 Advanced EMS Auditors Course (SGS & University of Pretoria)
- 2007: Introduction into Forestry Stewardship Council (FSC) (University of Pretoria)
- 2006: Permaculture training course (S.E.E.D)
- 2005: Project Management Course (Wildlife and Environment Society of South Africa (WESSA) Umgeni Valley)
- 2004: Grass and plant identification courses

Presentations

- July 2007: Environmental Education in a changing world, World Environmental Education Conference (WEEC), Durban
- Sept2006: Environmental Education, BGCI Conference, Oxford England

Selected Project Experience (2011 onwards)

1. Provincial Environmental Outlook Reports

- 2017-2018: Vegetation input: Gauteng Outlook Report
- in process*: Vegetation input: North-West Outlook Report

2. Open Space Planning

- Nov 2015: The proposed Kaalspruit Open Space Project, Thembisa, Gauteng. Kaalspruit River Rehabilitation Biodiversity Scan: (NuLeaf Planning and Environmental)

2015-2016: City of Johannesburg Open Space Planning – vegetation input for Linbro Park, Bassonia, Kyalami and Ruimsig areas (Iggdrasil)

3. Management- and Rehabilitation Plans

April-May 2012: Vegetation base line study and input into Biodiversity Action Plan for Kumba Iron Ore (Lidwala Consulting Engineers)

Jan 2015: Environmental Management Plan for the Krugersdorp Nature Reserve – vegetation section

Jan 2016: Tharisa Mine Railway Line – Vegetation rehabilitation plan (Limosella Consulting)

Sept 2016: General vegetation rehabilitation plan for the proposed Mezo Kitchens Panel Processing Facility (Shangoni)

Nov 2016: General Ecological Rehabilitation and Monitoring Plan for the N4 additional lane between: R52 Koster offramp & D1325 Marikana Interchange; and The R512 (Brits West Interchange) & K67 (Ga-Rankuwa Interchange) North West and Gauteng Provinces

Nov 2016: Biodiversity Management Plan: Afrisam (Sa) (Pty) Ltd, Dudfield Cement – vegetation input

June 2017: Rehabilitation planning for the Klip- Lower and Upper Rietspruit Water Management Units (Pregio, via Limosella Consulting)

Dec 2017: Eskom underground cable river crossings – vegetation input into rehabilitation plants (Envirolution)

4. Linear Infrastructure

March 2012: Kranspoort road upgrade Protected tree identification (Lidwala Consulting Engineers)

Oct 2012: Eskom: Perseus to Gamma Vegetation assessment (Mokgope Consulting)

March 2013: Diepsloot Eskom line and substation, Johannesburg (Envirolution)

Nov 2013: Masa Ngwedi 750kV and 400kV lines (Limpopo & North-West Provinces) Section D & E Vegetation Input for EMP (Mandara Consulting)

2013-2014 Eskom: Northern Alignments (Perseus in the Northern Cape to Juno in the Western Cape) (Mokgope Consulting)

Feb 2014: Meteor substation, as well as the 88kV line between the Pulsar, Meteor and Sonland substations, Sebokeng, (Nsovo Environmental Consulting)

Dec 2014: Upgrading of Internal Roads in Stinkwater, Hammanskraal (Gauteng) (GladAfrica)

Sept 2015: Railway Siding for GCMC Open Cast Mine, Lephalale (Limpopo)

Feb 2016: N4 - Additional lane between Brits and Rustenburg (Environamic)

Nov 2016: Aggeneis-Paulputs 400kV Powerline and Substations Upgrades

Feb 2017: Proposed Lulamisa to Diepsloot East to Blue Hills to Crowthorne 88kV Power Line / Cable and 2 Substations Gauteng (Envirolution)

May 2017: Proposed 132 kV Powerline Between Fochville Municipal Substation and an Existing Line, Gauteng Province (Envirolution)

5. Solar Developments

January 2012: Schmidtsdrift, Northern Cape Vegetation Assessment for Solar Panels (Nuleaf)

Aug 2015: Proposed Construction of A 75mw Solar Energy Facility Project, Limpopo Tshikovha Environmental and Communication Consulting

6. Mining

- April 2012: Rietfontein Open Cast Vegetation assessment (Cabanga Concepts)
Jan 2013: Vierfontein Colliery Vegetation assessment and EMP input (Cabanga Concepts)
Jan 2017: G&W Base and Industrial Minerals Koppies Betonite Mine Vegetation Assessment & Management Input Report (Cabanga Concepts)

7. Other Development

- Dec 2013: Marekele Bush camp – vegetation & fauna assessments (NuLeaf)
May 2013: Komati Power Station – Coal stockyard (Enviroolution)
April 2014: Blesboklaagte & Leeupoort Township development (Shangoni)
May 2014: Goldi Farm Composting Site, Section 24G Fauna and Flora assessment and Summary document (Shangoni)
Feb 2015: TOPIGS: Proposed Piggery, Mpumalanga (Shangoni)
May 2015: Kwaggasrant Recycling Facility Upgrade (Shangoni)
Oct 2016: Proposed piggery on portion 139 of the farm Honingnestkrans 269JR Vegetation and Fauna investigation (Methale Environmental Consulting)
Oct 2017: Ongoing Clinic Development & Proposed Emergency Medical Services Facility on Prt 79 of the farm De Wagendrift 417 JR Gauteng Province. (Methale Environmental Consultants)

8. Plant relocation and monitoring

- April 2014: Relocation of *C bulbipermum*, overlooked Colliery in Mpumalanga (Cabanga Concepts)
Feb 2017: Monitoring report for the relocated *Crinum bulbispermum* at Overlooked Colliery
May 2017: Relocation of protected plant species: Evander Mine
Feb 2018: Monitor populations of the Critically Endangered *Chlorophytum radula* at the Woodbush Plantation, Limpopo.

9. International:

- Oct 2009: Tatu, Nairobi: Vegetation Assessment (Kenya) (Lokisa Environmental Consulting)
Sept 2014: Vegetation input to the Regional Environmental and Social Assessment of Coal-based Energy Projects along the South Africa- Botswana Border (World bank Project, Mott MacDonald)

10. Mentorship:

- May 2017: Technical Peer Review of the vegetation section for the Emfuleni Bulk Water Supply Pipelines: Ecological Assessment. GIBB Engineering & Architecture (Pty) Ltd
Nov 2017: Mentorship and Technical Peer Review of the vegetation section for the Merensky-Kennedy Powerline: vegetation assessment GIBB Engineering & Architecture (Pty) Ltd