



# Scientific Aquatic Services

Applying science to the real world

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**Date:** Monday, 31 October 2022  
**Ref:** SAS 22-1178

## Dwarsrivier Chrome Mine

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**Attention: Ms. Thandiwe Buthelezi & Ms Marcia Malapane**

Dear Mam,

### **RE: LISTED ECOSYSTEM VERIFICATION AND IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A STORMWATER TRENCH AT THE DWARSRIVIER CHROME MINE (DCM) NORTH SHAFT.**

Scientific Aquatic Services (Pty) Ltd (SAS) was appointed by Dwarsrivier Chrome Mine (DCM) to verify the sensitivity and presence / absence of National Threatened Ecosystems (NTE) associated with the proposed construction of a stormwater trench at the DCM North shaft. The purpose of the stormwater trench at the North shaft operational area is to facilitate the separation/ diversion of clean stormwater away from the mine's operational areas. The separation and management of clean and dirty stormwater is an operational requirement for all mining operations within South Africa. The diverted clean stormwater will be discharged south of North shaft. The trench will be approx. 0.6 kilometres (km) in length and will be surrounded by an earth berm which varies in width (i.e., 10 metres (m) to 30 m) across the length of the trench.

DCM is located within the Greater Tubatse Local Municipality, within the boundaries of the administrative area of the Sekhukhune District Municipality, Limpopo Province. The DCM is situated approximately 30 km from Steelpoort (Limpopo Province) and 60 km from Lydenburg (which is located within the neighbouring Mpumalanga province). The proposed stormwater trench and associated earth berm forms the focus of this technical memorandum and will henceforth be referred to collectively as the "trench", as presented in Figures 1 and 2. The proposed trench footprint is located within well-vegetated, bushveld areas to the east of the operational areas of the North Shaft (Figure 1).

This memorandum, after consideration and the description of the ecological integrity of the trench, must guide the mitigation, construction, and rehabilitation interventions by means of the presentation of the results and recommendations as to the ecological viability of the proposed trench development activities.

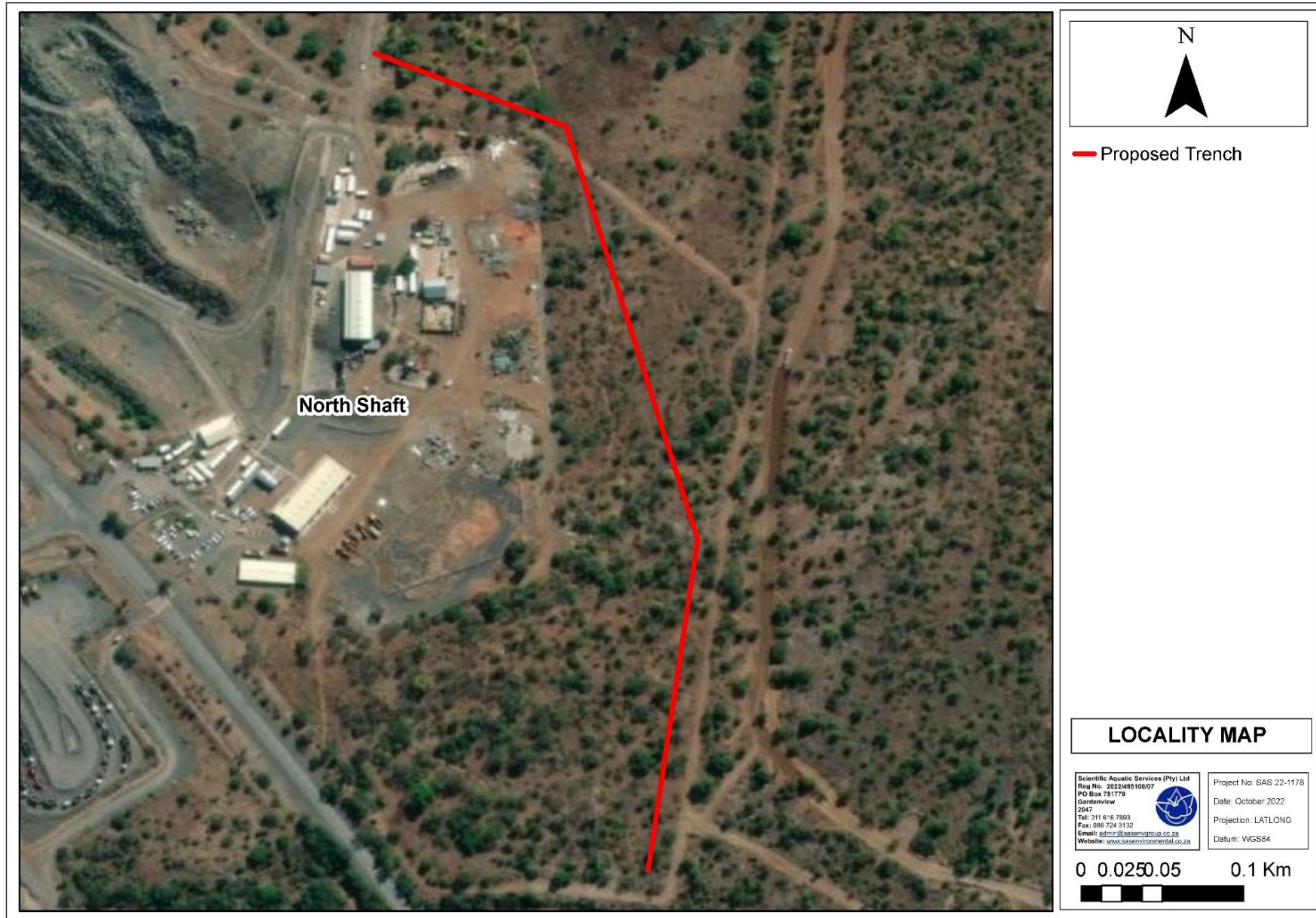


Figure 1: Locality map of the proposed trench footprint.



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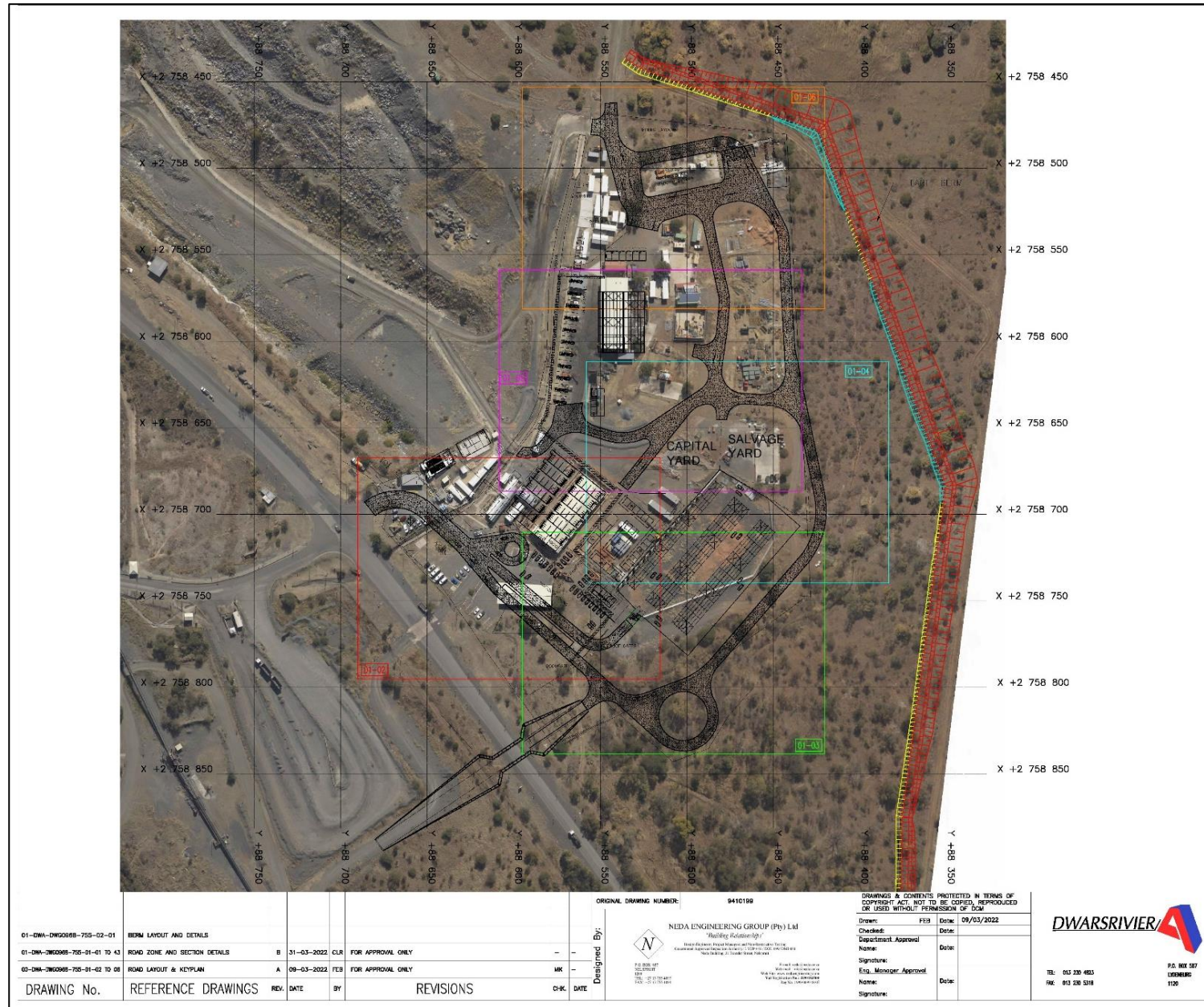


Figure 2: Layout map of the proposed trench (and associated berm) footprint as provided by DCM.



### **Project Scope**

Specific outcomes and terms of this technical memorandum are outlined below:

- To review all previous specialist studies undertaken for DCM with particular reference to the North shaft vicinity;
- To establish the sensitivity of the receiving environment from a floral perspective;
- To establish if construction of the proposed trench will result in the clearance of intact, representative NTE vegetation and associated habitat;
- To determine the environmental impacts that construction of the proposed trench may have on receiving environment and to develop mitigation and management measures; and
- To provide recommendations for the avoidance / minimisation of risks to the receiving environment.

### **Assumptions and Limitations**

The following assumptions and limitations are applicable to this memorandum:

- The ecological assessment was confined to the trench footprint area, and does not include the greater, surrounding areas;
- A 10 metre (m) buffer (i.e., 10 m either side of the trench) was used for mapping purposes only;
- A 15 m buffer (i.e., 15 m either side of the trench) is considered as the 'zone of impact' for the impact assessment, i.e., the zone/extent to which impacts associated with the proposed construction of the trench and associated earth berm are anticipated to encompass;
- The data presented in this memorandum are based on two sources of information, namely (1) a field assessment that encompassed the immediate, western surrounding areas of the trench which was undertaken on 3 August 2022 (winter) (see SAS 22-1133 (2022)), and (2) a review of all previous (available) studies pertaining to the mine. A more comprehensive assessment would require a field assessment take place in summer, with particular focus on the trench footprint. Nevertheless, on-site data was significantly augmented with all available desktop data and previous studies, and given previous experience within the area, the findings of this assessment are considered to be an accurate reflection of the floral ecological characteristics of the area in which the trench is located; and
- The scope of work as outlined above focuses on the verification of NTE vegetation within the proposed footprint of the trench and does not include a full or detailed ecological assessment of the footprint area or surrounding areas.

### **Legislative Requirements**

The following legislative requirements were considered during the assessment:

- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA); and
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
  - Government Notice (GN) number 1002: National List of Ecosystems that are Threatened and Need Protection dated 9 December 2011, as it relates to the NEMBA;
  - GN number R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated September 2020 as it relates to the NEMBA;
  - GN number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020, as it relates to the NEMBA; and
  - GN number 30568: Threatened or Protected Species (TOPS) list dated 14 December 2007, as it relates to the NEMBA.

The following databases were also considered:

- The National Vegetation Map Project (VEGMAP), with the below vector dataset used for information on Biomes, Bioregions and Vegetation Type(s):
  - 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a);



- The National List of Threatened Ecosystems 2011 and 2021<sup>1</sup> (SANBI 2011; SANBI 2021a and SANBI 2021b);
- From the National Biodiversity Assessment (NBA, 2018) Terrestrial Assessment project (Skowno et al, 2019):
  - 2018 Terrestrial ecosystem threat status and protection level - remaining extent (SANBI, 2018b); and
  - 2018 Terrestrial ecosystem threat status and protection level layer (SANBI, 2018c).
- The National Web-based Environmental Screening Tool (hereafter “Screening Tool”) (accessed 2022);
- The Mining and Biodiversity Guidelines (2012); and
- The Limpopo Conservation Plan (C-Plan) – 2018 data set.

### **Results of the Desktop Analysis**

The following is a summary of important features (on a desktop basis) that are associated with the proposed development:

- The trench is located within the savanna biome and within the Sekhukhune Mountain Bushveld vegetation type, i.e., the reference vegetation type. The Sekhukhune Mountain Bushveld is considered to be of least concern (LC) by both Mucina & Rutherford (2006) and the Update Vegetation Map;
- According to the NTE database (2011), the proposed trench is located entirely within Sekhukhune Mountainlands ecosystem, which is Endangered (EN). Key biodiversity features within this ecosystem include 19 plant species, including for example *Aloe fouriei*, *Gladiolus rufomarginatus*, *Lydenburgia cassinioides*, *Resnova megaphylla*, *Scilla natalensis* and *Zantedeschia pentlandii*. Five vegetation types including the Sekhukhune Montane Grassland, the Sekhukhune Mountain Bushveld, the Steenkampsberg Montane Grassland, the Lydenburg Thornveld, and the Ohrigstad Mountain Bushveld are located within the Sekhukhune Mountainlands ecosystem. The ecosystem forms part of the Sekhukhuneland Centre of Endemism; it includes important sub catchments, pans and wetlands and is important for grassland processes;
- The Screening Tool indicated that the proposed development is located (1) within an area of medium sensitivity from an Animal Species Theme, (2) within an area of low and medium sensitivity from a Plant Species Theme, and (3) within an area of very high sensitivity from an Terrestrial Biodiversity Theme;
- The Mining & Biodiversity Guidelines indicate that the development footprint is located within an area of Highest Biodiversity Importance. Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services; and
- The Limpopo C-Plan (2018 dataset) indicates that most of the proposed trench is located within a Critical Biodiversity Area 1 (CBA 1). A small section, associated with the northwest section of the trench, is located within areas identified as No Natural Remaining (NNR) areas.

### **List of Existing Biodiversity Assessments for Review**

Several studies (as listed below) pertaining to DCM (or sections thereof) are available and were thus reviewed (and terrestrial information gleaned where necessary) for the purposes of this memorandum. Many of these studies encompass the entire mining rights area of the DCM and thus do not provide fine scale habitat information pertaining to the trench footprint. However, the trench footprint area is located in the vicinity that was assessed for the 2022 permit application (SAS 22-1133 (2022)):

- SAS 215341 (2016). Biodiversity Action Plan (BAP) for the Dwarsrivier Chrome Mine Project Alignment and Amendment, Steelpoort, Limpopo Province. Prepared for Dwarsrivier Chrome Mine;

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<sup>1</sup> The National list of threatened terrestrial ecosystems published in terms of the NEMBA in 2011 remains in legal force and thus forms the focus of this memorandum. The 2021 Red List of Ecosystems was published in the government gazette on November 5th, 2021, for public comment (Gazette Notice no. 1476) and is not yet in force but is mentioned as an addition.



- SAS 218011 (2018a). Biodiversity Action Plan (BAP) 2018 Update for the Dwarsrivier Chrome Mine Project Alignment and Amendment, Steelpoort, Limpopo Province. Prepared for Dwarsriver Chrome Mine;
- SAS 218011 (2018b). Terrestrial Ecological Monitoring Report Update for the Dwarsrivier Chrome Mine, Steelpoort, Limpopo Province. Prepared for Dwars River Chrome Mine;
- SAS 218011 (2018c). Update of the Alien and Invasive Plant Control and Monitoring Plan for The Dwarsrivier Chrome Mine Project, Steelpoort, Limpopo Province. Prepared for Dwarsriver Chrome Mine;
- SAS 202265 (2022a). Terrestrial Monitoring Report Update for The Dwarsrivier Chrome Mine, Steelpoort, Limpopo Province. Prepared for Dwarsriver Chrome Mine;
- SAS 202265 (2022b). Update of the Alien and Invasive Plant Control and Monitoring Plan for The Dwarsrivier Chrome Mine Project, Steelpoort, Limpopo Province. Prepared for Dwars River Chrome Mine;
- SAS 202265 (2022c). Biodiversity Action Plan 2022 Update for the Dwarsrivier Chrome Mine, Steelpoort, Limpopo Province. Prepared for Dwarsriver Chrome Mine;
- SAS Biomonitoring Report Series (2009 – 2022). Aquatic Biomonitoring Report for the Groot Dwars River in the Vicinity of the Assmang Chrome: Dwars Rivier Mine. Report Series Prepared for Dwarsriver Chrome Mine; and
- SAS 22-1133 (2022). Tree Permit Application for The Proposed Expansion and Upgrade of the Clinic, Plant North Shaft Extensions at Dwarsrivier Chrome Mine, Steelpoort, Limpopo Province. Prepared for Dwarsriver Chrome Mine.

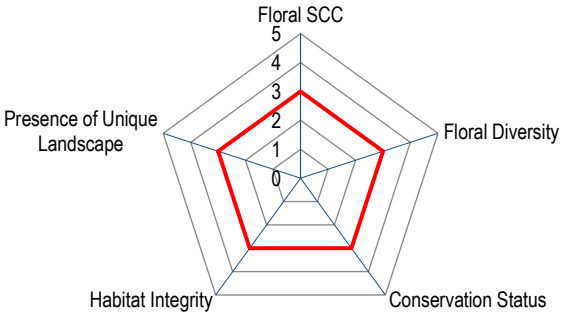
### ***High-level Habitat Results and Discussion***

Based on the field assessment that encompassed the immediate, western surrounding areas of the trench (which was undertaken on 3 August 2022 (winter) (see SAS 22-1133 (2022))), and (2) the review of all previous (available) studies pertaining to the mine, it was established that the habitat associated with the proposed trench is Mixed Bushveld Habitat (Figure 3 & 4); this habitat is located throughout the surrounding areas of the mine (including much of the mining rights area). Typically, floral species diversity within the Mixed Bushveld is moderate. Given information pertaining to this habitat (from reviewed studies and the site assessment), conclusions regarding the sensitivity and presence or absence of NTE habitat were drawn (Table 1).



**Figure 3: Representative habitat photographs illustrating the typical vegetation structure associated with the Mixed Bushveld Habitat. Images are only an indication of the habitat and were not taken within the vicinity of the footprint area**

**Table 1: Findings pertaining to the habitat sensitivity and presence/absence of NTE habitat for the proposed trench footprint.**

Component	Findings & Motivation
<p><b>NTE Habitat Present / Absent</b></p>	<p><b>NTE habitat is present within the footprint area.</b></p> <p>Although the habitat has experienced some degradation from nearby mining activities and associated edge effects (e.g., AIP proliferation, fragmentation, etc), the Mixed Bushveld Habitat is considered to be largely representative of the Sekhukhune Mountain Bushveld. Furthermore, the Mixed Bushveld habitat provides suitable habitat for several protected SCC as well as endemic species that are characteristic of the ecosystem (e.g., <i>Aloe castanea</i>, <i>Aloe cryptopoda</i>, <i>Elephantorrhiza praetermissa</i>, and <i>Triaspis glaucophylla</i>). Given this, the presence of NTE habitat within the proposed trench footprint area can be confirmed.</p>
<p><b>Habitat Sensitivity</b></p>	<p>The Mixed Bushveld Habitat is of <b>intermediate floral sensitivity</b><sup>2</sup>. This sensitivity was achieved based on the following:</p> <ul style="list-style-type: none"> <li>- Suitable habitat for an intermediate diversity of floral species of conservation concern (SCC) is available within the Mixed Bushveld Habitat. Potential SCC include nationally protected species as per the National Forest Act, 1998 (Act No. 84 of 1998, as amended) (NFA), threatened or protected species (TOPS) as per the 2007 regulations, and/or provincially protected species as per the Limpopo Environmental Management Act, 2003 (Act No.7 of 2003) (LEMA)). It should be noted that the field assessment conducted during August 2022 (which focused on identifying, marking and characterising NFA protected <i>Sclerocarya birrea</i> subsp. <i>caffra</i> individuals in the surrounding areas) were not recorded within this footprint area. It would be recommended that a walkdown of the study area be conducted prior to any vegetation clearing to ensure no other SCC (e.g., LEMA protected, TOPS and/or RDL species) are located within the development footprint;</li> <li>- An intermediate floral diversity was recorded within the habitat. The Mixed Bushveld floral communities present within the trench footprint area are considered to be similar to those expected within the reference vegetation type. Although some variation in species composition has occurred (due to degradation and edge effects), the Mixed Bushveld Habitat is considered to be representative of the reference vegetation type (i.e., the Sekhukhune Mountain Bushveld) in terms of overall species composition and structure;</li> <li>- The habitat has an intermediate conservation status (based on the location of the habitat within an EN NTE);</li> <li>- The Mixed Bushveld had a moderate habitat integrity since the Mixed Bushveld habitat within the trench footprint area has been subject to edge effects (e.g., alien, and invasive plant (AIP) proliferation, fragmentation, etc), which have subsequently impacted on the overall integrity of the habitat.; and</li> <li>- The Mixed Bushveld habitat provides unique landscape (e.g., lower lying mountainous regions).</li> </ul> <p>As such, the overall sensitivity of the habitat is considered to be intermediate.</p> <div style="text-align: center;">  </div>

<sup>2</sup> Refer to Appendix A for details on how the sensitivity of the habitat was calculated.



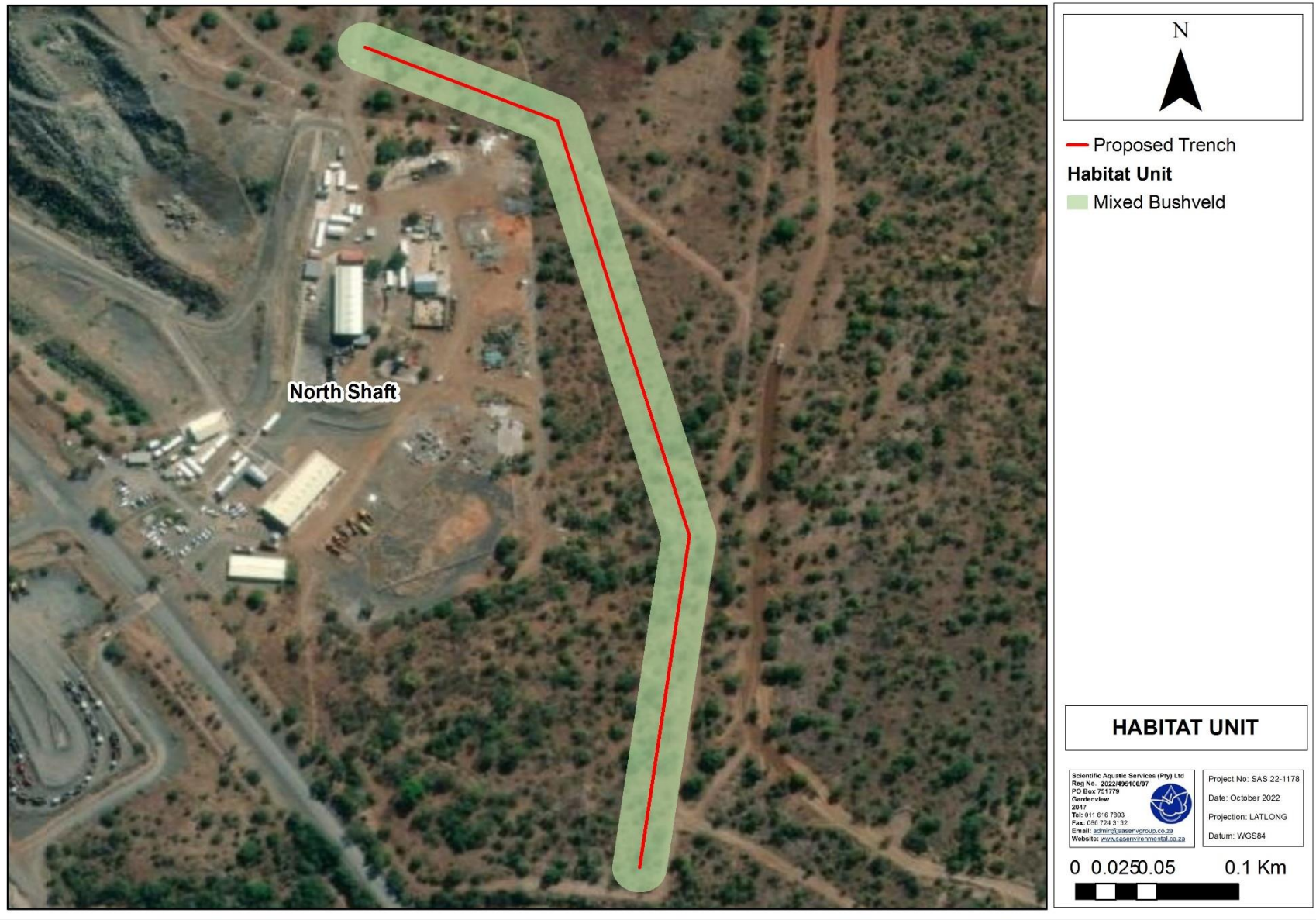


Figure 4: Habitat unit associated with the proposed trench footprint. Note: a 15 m buffer (i.e., 15 m either side of the trench to compensate for the berm) has been mapped to assist in the visual representation of the habitat.





**Impact Assessment**

An impact discussion and assessment of all potential Pre-construction & Planning, Construction and Operational, and Decommissioning & Rehabilitation Phase impacts for the proposed trench (and associated earth berm) are provided below (Tables 3 - 5). All mitigatory measures required to minimise the perceived impacts are presented in the impact table (Tables 3 - 5).

Table 2 indicates the perceived risks to the floral ecology associated with the activities pertaining to the proposed trench development.

**Table 2: Activities and aspects likely to impact on the floral resources associated with the proposed trench footprint.**

<b>ACTIVITIES AND ASPECTS REGISTER</b>	
<b>Pre-Construction &amp; Planning Phase</b>	
-	Potential failure to identify and relocate floral SCC (other than NFA protected species which have already been identified within the vicinity) to suitable habitat outside the development footprint. Note: previous field assessments indicated that no NFA protected marulas ( <i>Sclerocarya birrea</i> subsp. <i>caffra</i> ) are located within the footprint area or within 10 m of the proposed trench.
-	<b>Impact:</b> Loss of floral SCC within the development footprint area.
-	Potential failure to obtain permits for protected floral species (if encountered, i.e., LEMA, RDL, and/or TOPS species) that must be removed prior to the commencement of the construction phase.
-	<b>Impact:</b> Loss of floral SCC within the development footprint area.
-	Inconsiderate planning, infrastructure placement and design, within areas outside of the development footprint leading to the loss of potential sensitive floral species and/or habitat for such species, as well as unnecessary edge effect impacts on areas outside of the proposed development footprint.
-	<b>Impact:</b> Degradation and modification of the receiving environment, loss of floral habitat.
-	Potential failure to sufficiently update and implement the existing Alien and Invasive Plant (AIP) Management/Control plan, existing Rehabilitation Plan, and the existing Erosion Control Plan to include the proposed trench before the commencement of construction activities, which will result in the spread of AIPs from the development footprint to surrounding natural habitat or increase erosion potential.
-	<b>Impact:</b> Spreading of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat.
<b>Construction &amp; Operational Phase</b>	
-	Site clearing and the removal of vegetation considered to be representative of the NTE and CBA habitat.
-	<b>Impact:</b> Loss of floral habitat, diversity, and the possible loss of floral SCC.
-	Potential failure to monitor the success of relocated floral SCC (where applicable).
-	<b>Impact:</b> Loss of SCC individuals.
-	Proliferation of AIP species that colonise in areas of increased disturbances and that outcompete native species, including the further transformation of adjacent natural habitat.
-	<b>Impact:</b> Loss of favourable floral habitat outside of the direct development footprint, including a decrease in species diversity and a potential loss of floral SCC.
-	Additional pressure on floral habitat by increased human movement associated with the proposed construction activities, including increased vehicular movement, contributing to: <ul style="list-style-type: none"> <li>• Increased introduction and spread of AIPs; and</li> <li>• Increased risk of fire frequency.</li> </ul>
-	<b>Impact:</b> Loss of sensitive floral habitat and the potential loss of floral SCC.
-	Potentially poorly managed edge effects: <ul style="list-style-type: none"> <li>• Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to the continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the floral habitat; and</li> <li>• Compaction of soils outside of the development footprint due to indiscriminate driving of construction vehicles through natural vegetation.</li> </ul>
-	<b>Impact:</b> Loss of floral habitat, diversity, and SCC within the direct footprint of the proposed development. Loss of surrounding floral diversity and floral SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.
-	Dumping of overburden outside of designated areas, promoting the establishment of AIPs.
-	<b>Impact:</b> Loss of floral habitat, diversity, and SCC through displacement by AIPs.
<b>Decommissioning &amp; Rehabilitation Phases</b>	



**ACTIVITIES AND ASPECTS REGISTER**

- Potentially ineffective rehabilitation of exposed and impacted areas leading to a degraded vegetation state.
  - **Impact:** Permanent loss of floral habitat, floral diversity, and floral SCC due to habitat degradation and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.

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  - Potential poor management and failure to appropriately monitor rehabilitation efforts, leading to:
    - Landscapes left fragmented, resulting in reduced dispersal capabilities of floral species and a decrease in floral diversity;
    - Compacted soils and increased AIP cover limiting the re-establishment of natural vegetation; and
    - Increased risk of erosion in areas left disturbed.
  - **Impact:** Long-term (or permanent) loss of floral habitat, diversity, and SCC.

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  - Potentially poorly implemented and monitored AIP Management programme, leading to the reintroduction and proliferation of AIP species within the area.
  - **Impact:** Permanent loss of surrounding natural floral habitat, diversity, and SCC.

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  - Potential poor monitoring of relocated SCC.
  - **Impact:** Loss of SCC from the study area and poorly reinstated and represented floral SCC within rehabilitated areas.
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***Floral Impact Assessment***

The below tables (Tables 3 - 5) indicates the perceived risks to the floral ecology associated with all phases of the proposed maintenance and upgrade of the trench development. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this technical memorandum are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Please refer to Appendix B for impact assessment methodology.



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**Table 3: Pre-construction & Planning Phase impacts on the floral habitat, diversity, and SCC from the proposed development activities. Required mitigation measures are presented at the bottom of the table.**

Habitat	UNMANAGED							Significance	MANAGED							Significance
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence		Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	
<b>Impact of floral Habitat and Diversity</b>																
Mixed Bushveld	3	3	2	1	2	6	5	30	2	3	1	1	1	5	3	15
								Low								Very Low
<b>Impact on Floral SCC</b>																
Mixed Bushveld	4	3	2	1	2	7	5	35	4	3	1	1	1	7	3	21
								Low								Very Low
<b>Mitigation Measures for perceived impacts on habitat and species diversity</b>																
<ul style="list-style-type: none"> <li>• Design of infrastructure and layouts should be environmentally sound. The designs must adhere to all legislation requirements and all possible precautions taken to prevent potential spills and /or leaks, as well as unnecessary clearance of vegetation;</li> <li>• At all times, ensure that sound environmental management is in place during the Pre-construction &amp; Planning Phase;</li> <li>• Minimise loss of indigenous vegetation where possible through planning and suitable layouts. Layouts must avoid placement within habitat located outside of the proposed development footprint – especially where these areas coincide with NTE (i.e., the surrounding Mixed Bushveld habitat) and the occurrence of SCC (i.e., Mixed Bushveld provides suitable habitat for SCC);</li> <li>• It is recommended that prior to the commencement of construction activities the entire construction servitude be clearly demarcated to limit footprint creep and edge effects – especially where creep into surrounding NTE habitat can result in impacts on floral communities;</li> <li>• Prior to the commencement of construction activities, the existing AIP Management/Control Plan should be updated and implemented: <ul style="list-style-type: none"> <li>- The AIP Management/Control Plan should be implemented by a suitably trained individual. No chemical control of AIPs to occur without a certified professional;</li> <li>- Removal of alien invasive species should preferably commence during the Pre-construction &amp; Planning phase (as per the current AIP Control Plan) and continue throughout all phases of the proposed trench development; and</li> <li>- Prior to the commencement of construction activities on site, the existing rehabilitation plan should be updated for implementation throughout the subsequent phases (i.e., to accommodate concurrent rehabilitation).</li> </ul> </li> </ul>																
<b>Mitigation Measures for impacts on SCC</b>																
<ul style="list-style-type: none"> <li>• A walkdown of the footprint area should take place prior to vegetation clearing and should be conducted by a suitably qualified specialist;</li> <li>• Permits from the Limpopo Economic Development, Environmental and Tourism (LEDET) and/or authorisation from the Department of Forestry, Fisheries, and the Environment (DFFE) should be obtained to remove, cut, or destroy any provincially or nationally species (respectively) before any vegetation clearing may take place;</li> <li>• The relocation of floral SCC must take place prior to the commencement of the Construction and Operational Phase where vegetation clearing will occur. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation; and</li> <li>• It is recommended that for species that cannot be relocated (especially RDL species if encountered), seedlings and /or seeds of these species are harvested from the development footprint area before clearing activities commence and grown under nursery conditions with the purpose to use these species for rehabilitation at a later stage.</li> </ul>																



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**Table 4: Construction and Operational Phase impacts on the floral habitat, diversity, and SCC from the proposed development activities. Required mitigation measures are presented at the bottom of the table.**

Infrastructure	UNMANAGED							Significance	MANAGED							Significance
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence		Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	
<b>Impact of floral Habitat and Diversity</b>																
Mixed Bushveld	5	3	3	1	4	8	8	64	5	3	2	1	4	8	7	56
								Medium-Low								Medium-Low
<b>Impact on Floral SCC</b>																
Mixed Bushveld	3	3	3	1	2	6	6	36	2	3	2	1	2	5	5	25
								Low								Very Low
<b>Mitigation Measures for perceived impacts on habitat and species diversity</b>																
<b>Development footprint</b>																
<ul style="list-style-type: none"> <li>Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint – manage footprint creep to surrounding areas, especially as these areas provide NTE habitat;</li> <li>The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). The approved footprint area must be demarcated to avoid unnecessary clearing and destructing of natural vegetation;</li> <li>It is recommended that all construction personnel be educated in environmental awareness;</li> <li>Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities;</li> <li>It is recommended that existing roads be utilised and the construction of new roads minimised;</li> <li>No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble removed because of the excavation activities can be disposed of at one of the mines waste rock dumps – no excavated material to be dumped in the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be mulched and composted at the mine’s nursery;</li> <li>If any spills occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder floral rehabilitation down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and</li> <li>Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.</li> </ul>																
<b>Edge effect Management</b>																
<ul style="list-style-type: none"> <li>To limit edge effect impacts to the surrounding natural habitat, the below must be considered: <ul style="list-style-type: none"> <li>No construction rubble to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility;</li> <li>All soils compacted as a result of construction activities should be ripped, profiled and reseeded;</li> <li>Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil. Where construction activities have impacted habitat surrounding the berm, these areas should be levelled and revegetated with a mix of indigenous grass species. It should be ensured that the berms are structurally sound; and</li> <li>Manage the spread of AIP species which may affect remaining natural habitat within surrounding areas.</li> </ul> </li> </ul>																
<b>Fire</b>																
<ul style="list-style-type: none"> <li>No illicit fires must be allowed during the construction of the proposed development.</li> </ul>																



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### Rehabilitation

- Any areas that have been left bare because of the construction activities should be rehabilitated using indigenous species.

### Mitigation Measures for impacts on SCC

- Any unauthorised collection of floral material must be prohibited;
- Monitoring of any rescued and relocated floral SCC must commence during the Construction phase;
- Harvesting of protected floral species by construction personnel should be strictly prohibited; and
- Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed development footprint area.



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**Table 5: Decommissioning & Rehabilitation Phase impacts on the floral habitat, diversity, and SCC from the proposed development activities. Required mitigation measures are presented at the bottom of the table.**

Infrastructure	UNMANAGED							Significance	MANAGED							Significance
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence		Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	
<b>Impact of floral Habitat and Diversity</b>																
Mixed Bushveld	3	3	2	1	3	6	6	36 Low	2	3	1	1	3	5	5	25 Very Low
<b>Impact on Floral SCC</b>																
Mixed Bushveld	3	3	2	1	3	6	6	36 Low	2	3	1	1	3	5	5	25 Very Low
<b>Mitigation Measures for perceived impacts on habitat and species diversity</b>																
<b>Development footprint</b>																
<ul style="list-style-type: none"> <li>No additional habitat is to be disturbed during the Decommissioning &amp; Rehabilitation Phase of the development;</li> <li>No vehicles are allowed to indiscriminately drive through sensitive habitat and natural areas; and</li> <li>During the decommissioning, the decommissioning of temporary access roads or infrastructure (e.g., the proposed stormwater trench) should be implemented. All impacted and disturbed areas should be ripped, reprofiled and reseeded with indigenous species from the region that will assist to stabilise soils as soon as possible.</li> </ul>																
<b>Rehabilitation</b>																
<ul style="list-style-type: none"> <li>All infrastructure footprints that will be decommissioned should be concurrently rehabilitated in accordance with a rehabilitation plan compiled by a suitably trained specialist;</li> <li>All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure land-use objective; and</li> <li>Rehabilitation efforts must be implemented for a period of at least five years after decommissioning. A mix of indigenous grass seeds can be used during rehabilitation activities.</li> </ul>																
<b>Mitigation Measures for impacts on SCC</b>																
<ul style="list-style-type: none"> <li>Monitoring of rescued and relocated floral SCC should continue during the Decommissioning &amp; Rehabilitation phase until it is evident that the species have successfully established;</li> <li>As far as possible, no collection of floral SCC within the proposed footprint area or adjacent natural habitat must be allowed during the Decommissioning &amp; Rehabilitation phase of the development; and</li> <li>Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC or suitable habitat for such species outside of the proposed development footprint.</li> </ul>																



### **Impact Discussion**

The direct impact of the proposed trench development on the floral ecology is anticipated to vary between low and very low prior to the implementation of mitigation measures. If mitigation measures are implemented, the impact significance for the proposed trench development are anticipated to reduce.

Prior to mitigation measures the i) Pre-construction & Planning Phase, ii) Construction and Operational Phase and iii) Decommissioning & Rehabilitation Phase scored an impact significance as follows:

- Pre-construction & Planning Phase: This phase scored an impact of low;
- Construction and Operational Phase: This phase scored an impact significance of medium-low to low; and
- Decommissioning & Rehabilitation Phase: This phase scored an impact significance of low.

With mitigation measures implemented, the direct and indirect impacts on the floral ecology for the identified roads may be reduced as follows:

- Pre-construction & Planning Phase: With the implementation of mitigation measures, this phase scored a lowered impact significance of very low;
- Construction and Operational Phase: With the implementation of mitigation measures, this phase scored a lower impact significance of medium-low to very low; and
- Decommissioning & Rehabilitation Phase: With the implementation of mitigation measures, this phase scored a lowered impact significance of very low.

As part of the proposed mitigation measures, all disturbed areas, including areas not within the development footprint, must be rehabilitated appropriately and AIP establishment controlled within such areas.

### **Impact on Floral Habitat and Diversity**

The data gathered during the site visit and from the reviewed studies indicate that the Mixed Bushveld Habitat is of **intermediate sensitivity**.

The most significant impacts deemed likely to affect the floral habitat integrity and species diversity within the proposed development footprint include, but are not limited to, the following:

- Loss of indigenous floral habitat and diversity resulting from vegetation clearing activities;
- AIP proliferation into adjacent natural vegetation (including intact NTE habitat), displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species; and
- Increased human populations in the surrounding area resulting in greater pressure on natural floral habitat.

### **Impacts on Floral SCC**

Suitable habitat for an array of floral SCC is available within the Mixed Bushveld Habitat. Potential SCC include nationally protected species as per the NFA, TOPS as per the 2007 regulations, and/or provincially protected species as per the LEMA. It should be noted that the field assessment conducted during August 2022 (which focused on identifying and characterising NFA protected *Sclerocarya birrea* subsp. *caffra* individuals in the surrounding areas) were not marked within this footprint area.

It is advised that a walkthrough of the direct footprint areas be conducted before the commencement of any development or construction activities. Should any SCC be encountered within this footprint area these must be rescued and relocated by a suitably qualified specialist either to suitable habitat (outside the development footprint) or moved to registered nurseries such as the Agricultural Research Council (ARC) or the South African National Biodiversity Institute (SANBI). Permits and authorisation must be obtained from the relevant authorities to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place.

### ***Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas***

Although the proposed trench development is located within significant biodiversity features, e.g., within CBA 1 habitat and within an EN NTE (namely the Sekhukhune Mountainlands ecosystem), the scale of the proposed development and therefore the associated impacts are expected to be less significant and unlikely to alter the function of the ecosystem, provided that strict implementation of proposed mitigation measures occurs. The surrounding natural vegetation within the local region is unlikely to be impacted by the proposed development if mitigation measures and monitoring is implemented.

### ***Probable Residual Impacts***

Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key latent impacts that have been identified:

- Loss of floral habitat (including intact NTE and CBA 1 habitat) within the footprint area;
- Loss and alteration of floral species diversity with the footprint area; and
- Continued AIP proliferation within the study is and to adjacent vegetation communities.

### ***Cumulative Impacts***

The greatest threat to the floral ecology within the surrounding area of the proposed development footprint is the continued threat of mining as well as the continued proliferation of AIP species, resulting in the overall loss of native floral communities within the local area. It should be noted that despite current, isolated footprint, if additional developments occur in this ecosystem and/or CBA then impacts on the NTE and CBA would need to be carefully considered.

### ***Conclusion***

SAS was appointed by DCM to verify the sensitivity and presence / absence of NTE associated with the proposed construction of a stormwater trench at the mines North shaft.

With reference to a recent site visit within the vicinity of the proposed development footprint, together with information gleaned from reviewed studies pertaining to the terrestrial ecology of the mine, it was established that the associated habitat to be impacted on by the proposed trench development consists of Mixed Bushveld Habitat. This ecological integrity of this habitat is largely intact, although impacts from neighbouring mining activities are evident (e.g., AIP proliferation, etc). The floral communities within the Mixed Bushveld habitat are representative of the reference vegetation type and thus the presence of representative EN NTE habitat is confirmed within the footprint area.

We trust that we have interpreted your requirements correctly. Please do not hesitate to contact us if there are any aspects you would like to discuss further.

Yours Faithfully,

Samantha-Leigh Daniels

Christien Steyn  
Pri.Sci.Nat. (SACNASP)





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## APPENDIX A: FLORAL HABITAT SENSITIVITY

The floral habitat sensitivity of each habitat unit was determined by calculating the mean of five different parameters which influence floral communities and provide an indication of the overall floristic ecological integrity, importance and sensitivity of the habitat unit. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Floral SCC:** The confirmed presence or potential for floral SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Unique Landscapes:** The presence of unique landscapes or the presence of an ecologically intact habitat unit in a transformed region;
- **Conservation Status:** The conservation status of the ecosystem or vegetation type in which the habitat unit is situated based on local, regional and national databases. Whether the habitat is representative of a Critical Biodiversity Area or forms part of an Ecological Support Area is also taken into consideration;
- **Floral Diversity:** The recorded floral diversity compared to a suitable reference condition such as surrounding natural areas or available floristic databases; and
- **Habitat Integrity:** The degree to which the habitat unit is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the floral habitat sensitivity class in which each habitat unit falls. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the habitat unit in question. In order to present the results use is made of spider diagrams to depict the significance of each aspect of floral ecology for each vegetation type. The different classes and land-use objectives are presented in the table below:

**Table A1: Floral habitat sensitivity rankings and associated land-use objectives.**

Score	Rating significance	Conservation objective
1 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimizing development potential.
≥3.5 <4.5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
≥4.5 ≤5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

## APPENDIX B: IMPACT ASSESSMENT SENSITIVITY

For the Environmental Assessment Practitioner (EAP) to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below. The first stage of risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation.
- An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'<sup>3</sup>. The interaction of an aspect with the environment may result in an impact.
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to Table 3. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance-rating matrix and are used to determine whether mitigation is necessary<sup>4</sup>.

The assessment of significance is undertaken twice. Initial, significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment considers the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

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<sup>3</sup> The definition has been aligned with that used in the ISO 14001 Standard.

<sup>4</sup> Some risks/impacts that have low significance will however still require mitigation.



**Table D1: Criteria for assessing significance of impacts**  
**LIKELIHOOD DESCRIPTORS**

<b>Probability of impact</b>	<b>RATING</b>
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
<b>Sensitivity of receiving environment</b>	<b>RATING</b>
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

**CONSEQUENCE DESCRIPTORS**

<b>Severity of impact</b>	<b>RATING</b>
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
<b>Spatial scope of impact</b>	<b>RATING</b>
Activity specific/ < 5 ha impacted / Linear developments affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Linear developments affected <	2
Local area/ within 1 km of the site boundary / < 500ha impacted / Linear developments affected < 500m	3
Regional within 5 km of the site boundary / < 1000ha impacted / Linear developments affected < 1000m	4
Entire habitat unit / Entire system/ > 1000ha impacted / Linear developments affected > 1000m	5
<b>Duration of impact</b>	<b>RATING</b>
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5



Table D2: Significance Rating Matrix.

		CONSEQUENCE (Severity + Spatial Scope + Duration)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LIKELIHOOD (Frequency of activity + Frequency of impact)	1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	2	4	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	3	6	9	12	16	20	24	28	32	36	40	44	48	52	56	60
	4	8	12	16	20	25	30	35	40	45	50	55	60	65	70	75
	5	10	15	20	24	30	36	42	48	54	60	66	72	78	84	90
	6	12	18	24	30	36	42	49	56	63	70	77	84	91	98	105
	7	14	21	28	35	42	49	56	64	72	80	88	96	104	112	120
	8	16	24	32	40	48	56	64	72	81	90	99	108	117	126	135
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160

Table D3: Positive/Negative Mitigation Ratings.

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very high	126-150	Critically consider the viability of proposed projects Improve current management of existing projects significantly and immediately	Maintain current management
High	101-125	Comprehensively consider the viability of proposed projects Improve current management of existing projects significantly	Maintain current management
Medium-high	76-100	Consider the viability of proposed projects Improve current management of existing projects	Maintain current management
Medium-low	51-75	Actively seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Low	26-50	Where deemed necessary seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Very low	1-25	Maintain current management and/or proposed project criteria and strive for continuous improvement	Maintain current management and/or proposed project criteria and strive for continuous improvement

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the client and its contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
    - Risks/Impacts were assessed for all stages of the project cycle including:
      - Pre-construction;
      - Construction; and
      - Operation.
        - If applicable, transboundary, or global effects were assessed.
        - Individuals or groups who may be differentially or disproportionately affected by the project because of their *disadvantaged* or *vulnerable* status were assessed.
        - Particular attention was paid to describing any residual impacts that will occur after rehabilitation.



### ***Mitigation measure development***

The following points present the key concepts considered in the development of mitigation measures for the proposed development.

- *Mitigation and performance improvement measures* and actions that address the risks and impacts<sup>5</sup> are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation, or compensation.
- Desired outcomes are defined and have been developed in such a way as to be *measurable events with performance indicators, targets and acceptable criteria* that can be tracked over *defined periods*, with estimates of the *resources* (including human resource and training requirements) *and responsibilities for implementation*.

### ***Recommendations***

Recommendations were developed to address and mitigate impacts associated with the proposed development. These recommendations also include general management measures which apply to the proposed development as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the operation from planning, through to construction and operation.

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<sup>5</sup> Mitigation measures should address both positive and negative impacts.

