FAUNA & FLORA SPECIALIST REPORTFOR THE PROPOSED EXPANSION OF RAILWAY LOOPS AT THABAZIMBI, FERROGATE AND NORTHAM IN LIMPOPO PROVINCE

PREPARED FOR NSOVO

ON BEHALF OF TRANSNET

BY

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DECLARATION OF CONSULTANTS' INDEPENDENCE

- I Simon Todd, as the appointed independent specialist hereby declare that I:
- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have 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 NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 as amended by the 2017 (specifically in terms of regulation 12 of GN No. R. 982) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 48 of GN No. R. 982.

June 2017

1 INTRODUCTION

As part of the Waterberg Stage 2-5 Limpopo Loops project, Transnet is proposing to construct three railway loops at Ferrogate, Northam and Thabazimbi, in the Limpopo Province; which forms part of the upgrade of the line to increase capacity of the line for coal exports. Transnet has appointed Nsovo as the independent Environmental Assessment Practitioner (EAP) to undertake the required Basic Assessment (BA) process for the above-mentioned project. The loops would be up to 4km long and would extend beyond the current Transnet servitude. In addition an ablution facility and a septic tank system would be built at the Thabazimbi site. A Basic Assessment process for authorization would be required.

As part of the Basic Assessment process, Nsovo have commissioned this specialist ecological study in order to characterize the ecological features of the site and provide an assessment of the likely impacts associated with the construction and operation of the loops on the fauna and flora present at the site. Impacts are assessed for the construction and operation phases of the development. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development which should be included in the EMPr for the development. The full scope of study is detailed below.

1.1 SCOPE OF STUDY

The scope of the study includes the following activities

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project
- a description and evaluation of environmental issues and potential impacts (including using direct, indirect and cumulative impacts) that have been identified
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- an indication of the methodology used in determining the significance of potential environmental impacts
- an assessment of the significance of direct indirect and cumulative impacts in terms of the following criteria :
    - the nature of the impact, which shall include a description of what causes the effect, what will be affected and how it will be affected
    - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
    - the duration of the impact, indicating whether the lifetime of the impact will

be of a short-term duration (0-5 years), medium-term (5- 15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity) or permanent
    - the probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (Impact will occur regardless of any preventable measures)
    - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit) severe/beneficial (long-term impact that could be mitigated/long-term benefit) moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight or have no effect
    - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
    - the status which will be described as either positive, negative or neutral
    - the degree to which the impact can be reversed
    - the degree to which the impact may cause irreplaceable loss of resources
    - the degree to which the impact can be mitigated

- a description and comparative assessment of all alternatives
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr)
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- a description of any assumptions uncertainties and gaps in knowledge
- an environmental impact statement which contains :
    - a summary of the key findings of the environmental impact assessment;
    - an assessment of the positive and negative implications of the proposed activity;
    - a comparative assessment of the positive and negative implications of identified alternatives

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment has been conducted according to the 2017 amended EIA Regulations as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should.

    - In order of priority; aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and
    - Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:
The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;

- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

Species level

- Species of Conservation Concern (SCC) (giving location if possible using GPS)
- The viability of an estimated population size of the SCC species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- The likelihood of other Red Data Book (RDB) species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species);
    - or, are of cultural significance.
- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of the cover of alien plants of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients,

migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)

- Any possible changes in key processes e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

There are three loops being developed under the current application, located at Northam, Ferrogate and Thabazimbi (Figure 1). The railway loops would be up to 4km long and would extend beyond the current Transnet servitude. These loops will be used as a locomotive change-over yard, while Thabazimbi will also include an ablution facility to provide for the change of train drivers between shifts. A Septic tank system is to be adopted and water will be provided from 20 000 litres water tanks. There are existing access roads along most sections of the railway line and as the loops would impinge upon these roads, new gravel access roads 2-4m wide would be required adjacent the new loop sections.

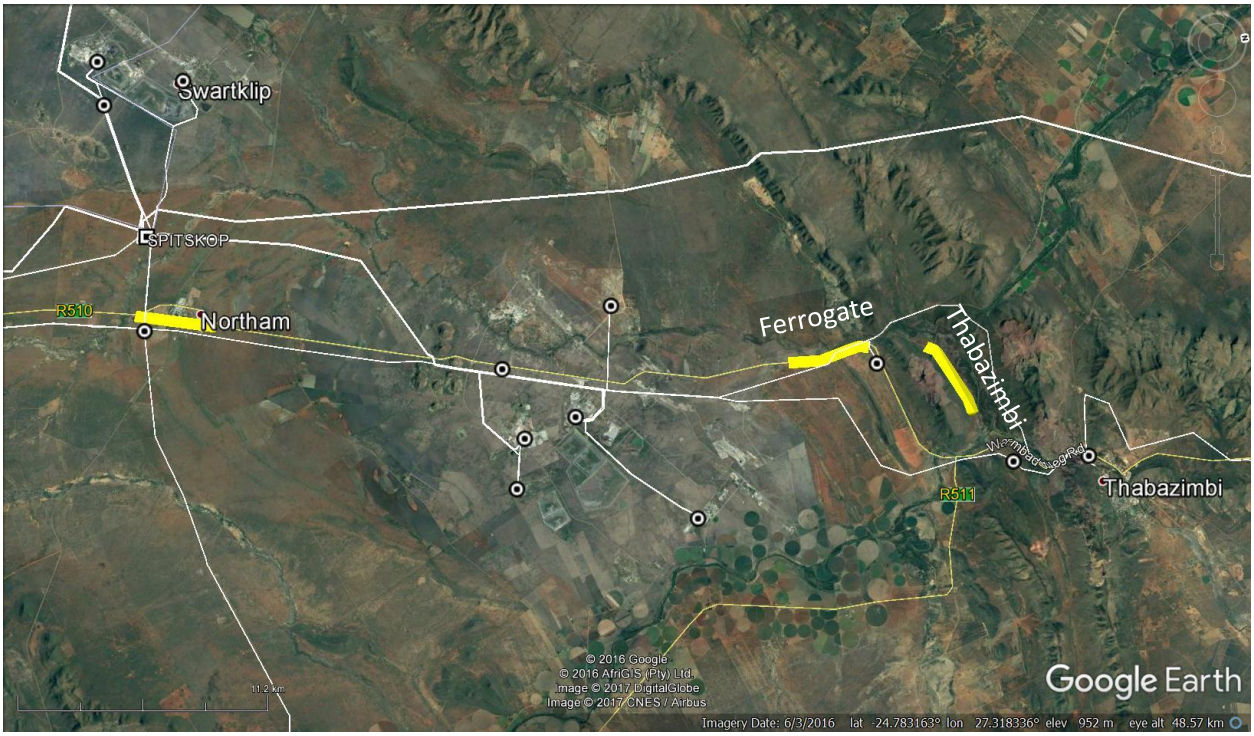


Figure 1. Map of the Thabazimbi study area, showing the location of the three proposed loops, with Northam, Ferrogate and Thabazimbi from left (south) to right (north).

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

The data sources consulted and used where necessary in the study includes the following:

- Information on plant and animal species recorded for the Quarter Degree Square (QDS) 2427CD and 2427CB was extracted from the SABIF/SIBIS database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself has probably not been well sampled in the past.
- Critical Biodiversity Areas for the site and surroundings were extracted from the Limpopo CBA Map (Desmet, P. G., Holness, S., Skowno, A. & Egan, V.T. 2013: Limpopo Conservation Plan v.2)
- The IUCN conservation status (Table 1) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2016).

- Threatened Ecosystem data was extracted from the NEM: BA listed ecosystems layer (SANBI 2008).
- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006, Powrie 2012) as well as the National List of Protected Ecosystems (2011).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystems Protection Assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (ADU, SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, EWT & SANBI (Red List of Mammals of South Africa, Lesotho and Swaziland, 2016) and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 2016 (See Figure 3) and where species have not been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

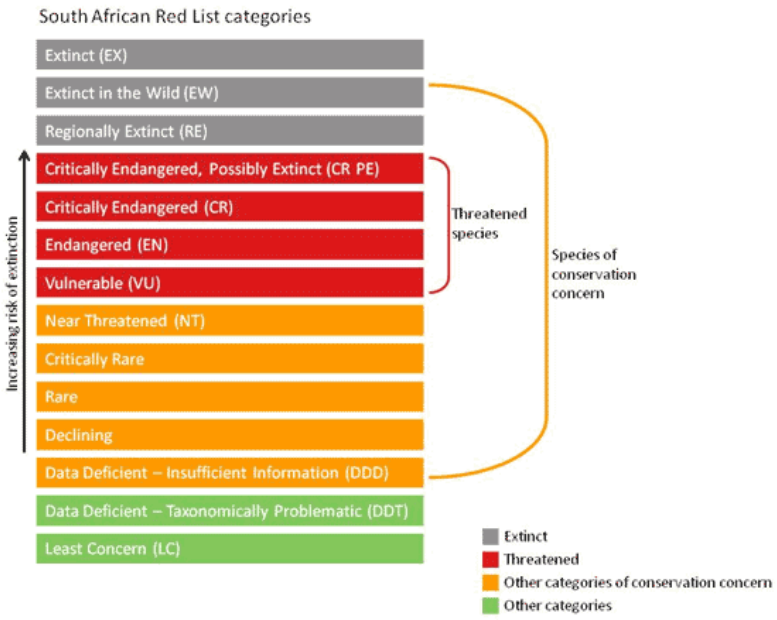


Figure 3. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

2.2 Site Visit

The site was visited in late April 2017 during the late summer season, following very good rains in the area. The vegetation at each site was in a good growing condition, with most species in flower or seed. As a result, the vast majority of the species present were identified and there is little uncertainty as to the presence and identity of the plant species present at each site. During the site visit, each site was investigated in the field and all plant species present were recorded. Sensitive habitats were identified and mapped in the field with a GPS.

2.3 Sampling Limitations and Assumptions

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant and animal species present are captured. However, this is rarely possible due to time and cost constraints and therefore, the representivity of the species sampled at the time of the site visit should be critically evaluated.

The sites were visited at an optimal time of year for vegetation sampling, following good summer rains. The majority of species present were in flower or seed and could be identified and there are not likely to be any species of significance present that could not be observed or identified during the site visit. As a result, there are few, if any, limitations with regards to the vegetation sampling at the sites. The lists of amphibians, reptiles and mammals for the study areas are based on those observed in the vicinity of the sites as well as those likely to occur in the area based on their distribution and habitat preferences. This

represents a sufficiently conservative and cautious approach which takes the study limitations into account.

2.4 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases. This includes delineating the different habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the observed presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Figure 3) Ferrogate and Northam are located within the Dwaalboom Thornveld vegetation type. The Thabazimbi loop is located within the Waterberg Mountain Bushveld vegetation type. [1]

The Dwaalboom Thornveld is distributed in the Limpopo and North-West Provinces on the flats north of the Dwarsberge and associated ridges west of the Crocodile River in the Dwaalboom area, and includes a patch of vegetation around Sentrum. It extends southwards from the ridges to the Nietverdiend area, north of Pilanesberg to the Northam area at altitudes of 900-1200m (Mucina & Rutherford 2006). The vegetation type is represented by plains with a layer of scattered low to medium high deciduous microphyllous trees and shrubs and an almost continuous herbaceous layer dominated by grass species. *Acacia tortilis* and *A. nilotica* dominate on medium clay soils, *A. tenuispina* dominates on heavy clays and *A. erubescens* dominates on the sandy clay loams and the alternation of these susbstrate types creates a mosaic of 1-5km wide patches (Mucina & Rutherford 2006).

According to Mucina and Rutherford (2006), important taxa in the trees include the above-listed species, as well as *A. fleckii, Combretum imberbe*. Tall shrubs include *Acacia hebeclada subsp hebeclada, Combretum hereroense, Euclea undulata*, and low shrubs include *Abutilon austro-africanum, Aptosimum elongatum* and *Hirpicium bechuanense*. Graminoids of importance include: *Aristida bipartita, Digitaria eriantha subsp eriantha, Ischaemum afrum*. The vegetation type is listed as *Least Threatened*. About 6% is conserved and 14% transformed by cultivation. It is low in species diversity and endemic species.

The Waterberg Mountain Bushveld occurs in Limpopo on the Waterberg Mountains, including the foothills, escarpment and tablelands south of the line between Lephalale and Marken and north of Bela-Bela and west of Mokopane, with outliers near the Vlieepoortberge near Thabazimbi. It generally occurs at an altitude of 1000-1600m (Mucina & Rutherford 2006). The vegetation consists of *Faurea saligna-Protea caffra* bushveld on higher slopes which grades into broad-leaved deciduous bushveld dominated by *Diplorhychus condylocarpon* on rocky mid- and footslopes to *Burkea africana-Terminalia sericea* savanna in the lower lying slopes (Mucina & Rutherford 2006). The grass layer is moderately or well-developed.

According to Mucina & Rutherford (2006), important tree taxa include *Acacia robusta, A. caffra, Burkea africana*, and shrubs include *Elephantorrhiza burkei, Combretum moggii, C.*

[1] This correlates to the latest *Mucina, L., Rutherford, M.C., Powrie, L.W., van Niekerk, A. & van der Merwe, J.H. (eds), with contributions by 47 others... 2014. Vegetation Field Atlas of Continental South Africa, Lesotho and Swaziland. Strelitzia 33. South African National Biodiversity Institute, Pretoria*

nelsonii, and low shrubs include *Anthospermum rigidum subsp rigidum* and *Barleria affinis*. Important graminoids include, amongst others, *Loudetia simplex, Schizachyrium sanguineum, Trachypogon spicatus*. The biogeographically important taxa include *Encephalartos eugene-maraisii* and *Choriscora transvaalensis*. Endemic taxa include *Grewia rogersii* and *Pachystigma triflorum*. It is considered Least Threatened with a conservation target of 24%. Approximately 9% is statutorily conserved, but only 3% is transformed. Erosion is low.

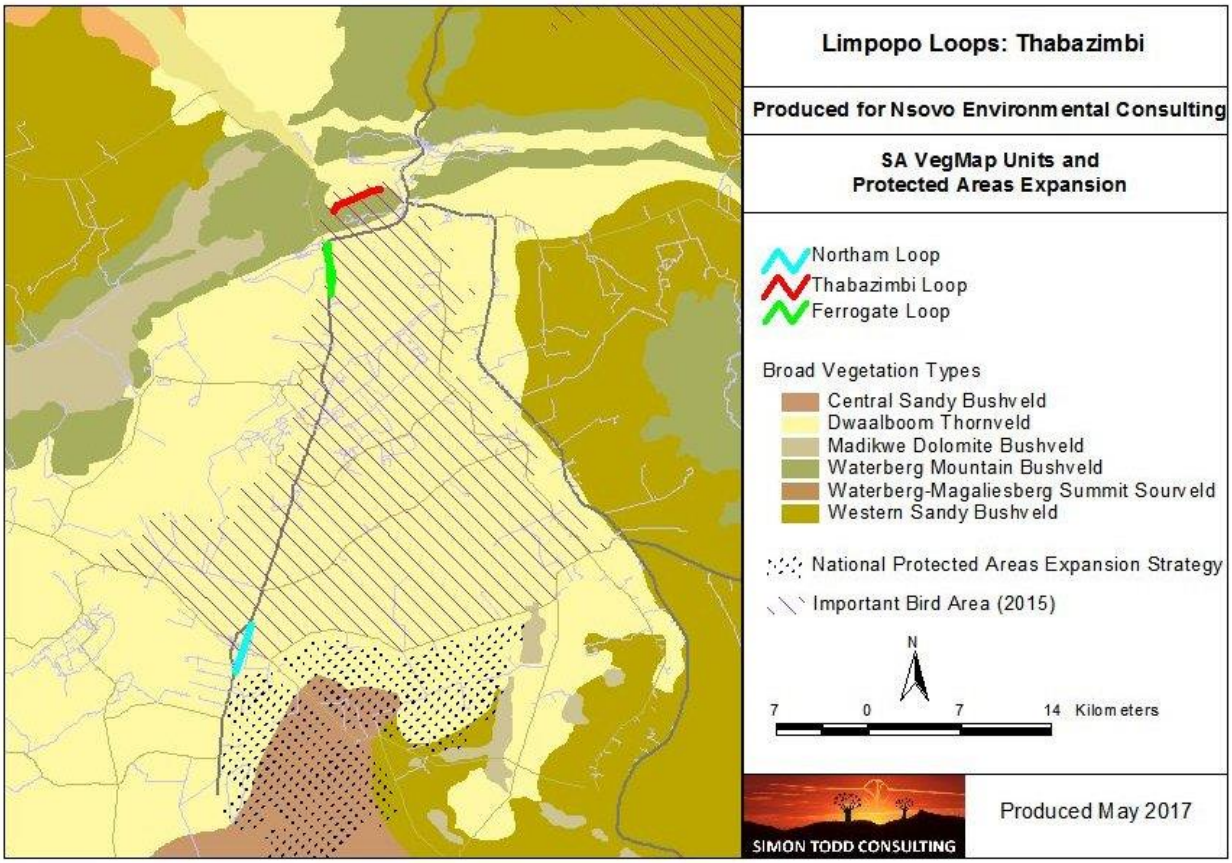


Figure 3. Vegetation map (Mucina and Rutherford 2012) of the project study area, showing the National Protected Areas Expansion layer and the Important Bird Area in the region as well. .

3.2 LISTED & PROTECTED PLANT SPECIES

According to the SANBI SIBIS database, approximately 270 indigenous plant species have been recorded from the broad area around the loop sites. This includes only 2 species of high conservation concern, *Freylinia tropica* (Rare) and *Jamesbrittenia bergae* (VU), neither of which was observed at any of the loop sites. There were however some nationally protected tree species present at the sites. Two individuals of *Boscia albitrunca* were observed on a small rocky hill along the Ferrogate loop. It is possible that these will be

affected if there is additional rock cutting required to widen the current gap in the existing cutting. At the Thabazimbi loop, there is an individual Leadwood tree *Combretum imberbe* next to the line, but as this is on the other side from the planned loop, it would not be affected by the proposed activities.

Boschia albitrunca – This is not taken at the Ferrogate site, but provided for identification and illustration purposes. The trees at the site are growing on a steep face of a rocky outcrop where it was not possible to get a useful picture of the actual trees present.

3.3 SITE DESCRIPTION

Northam Site Description

The majority of the area affected by the Northam loop is within an urban or transformed environment. It is only the northern limit of the loop that will have an impact on natural vegetation. The areas in and near Northam are dominated by weedy and alien species with some tolerant indigenous grasses or trees persisting along the sides of the existing track and railway servitude. Dominant and common species present in this area (please see

figures below for depiction of the vegetation at the sites) include trees such as Syringa, *Melia azedarach* (Alien), *Searsia lancea*, *Acacia tortillis*, *Acacia nilotica*, *Acacia caffra*, *Zizyphus mucronata* and *Dichrostachys cinerea*. Indigenous forbs present include *Hirpicium bechuanense*, *Sesamum capense*, *Hermbstaedtia odorata* while grasses present include *Aristida bipartita*, *Cynodon dactylon*, *Ischaemum afrum*, *Panicum coloratum*, *Aristida congesta*, *Enneapogon cenchroides*, *Tragus bertonianus*, *Cenchrus ciliaris*, *Melinis repens* and *Heteropogon contortus*. Common alien and weedy species present include *Bidens pilosa*, *Phytolacca americana*, *Argemone ochroleuca*, *Tribulis terrestris*, *Datura stramonium*, *Conyza bonariensis*, *Tagetes minuta*, *Alternanthera pungens*, *Zinnia peruviana* and *Schkuhria pinnata*.

The southern end of the Northam Loop is on the edge of Northam, with little natural vegetation remaining. The affected area is transformed and agricultural land.

The central part of the Northam loop runs through the town itself and is highly disturbed. Dominant species include the alien Syringa tree and the grass along the line is mostly *Cenchrus ciliaris*.

The Northam loop just north of the town, dominated by Syringa and weedy species, with some *Acacia tortillis* further away from the line.

The northern end of the Northam loop is the only part of the loop with some natural vegetation. Common and dominant species include *Grewia flava*, *Zizyphus mucronata*, *Acacia tortillis* and *Acacia erubescens*.

Ferrogate Site Description

The southern section of the Ferrogate Loop lies parallel to the R510 and the space between the road and railway line where the loop will be located, has already been largely transformed. There is also a large previously disturbed area around the existing Ferrogate siding which has several alien species present. Areas of natural vegetation that would be affected include a small rocky hill south of the existing Ferrogate siding and the area to the north of the siding. Overall, the majority of the affected area is however transformed and the total extent of habitat loss resulting from the development would be low.

Dominant and typical species present along the Ferrogate loop includes trees such as *Melia azedarach* (Alien), *Searsia lancea*, *Acacia karoo*, *Zizyphus mucronata* and *Dichrostachys*

cinerea. Indigenous forbs present include *Hirpicium bechuanense*, *Asparagus cooperi*, *Sesamum capense*, N*idorella hottentotica*, *Hermbstaedtia odorata* and *Clematis brachiata* while grasses present include *Pennisetum setaceum* (alien), *Aristida bipartita*, *Cynodon dactylon*, *Ischaemum afrum*, *Panicum coloratum*, *Aristida congesta*, *Enneapogon cenchroides*, *Tragus bertonianus*, *Cenchrus ciliaris*, *Melinis repens* and *Heteropogon contortus*. Alien and weedy species present include *Bidens pilosa*, *Phytolacca americana*, *Tribulis terrestris*, *Datura stramonium*, *Conyza bonariensis*, *Tagetes minuta, Zinnia peruviana* and *Alternanthera pungens*. Species present on the small rocky hill at the site include *Pavonia burchellii*, *Abutilon austro-africanum*, *Combretum hereroense*, *Boscia albitrunca*.

The southern end of the Ferrogate line runs adjacent to the R510 tar road and the loop would have little impact on natural vegetation in this section. The grass along the side of the railway line is *Cenchrus ciliaris*.

The existing siding at Ferrogate, with the alien Fountain grass *Pennisetum setaceum* prominent in the disturbed areas.

Looking north from the small hill south of the current siding, showing the existing extent of disturbance along the line in the vicinity of the current siding.

The northern end of the Ferrogate line runs through intact bushveld. Dominant species include Acacia karoo,

Thabazimbi Site Description

The Thabazimbi loop is located within intact natural vegetation and as such is significantly more sensitive than the other loops. Although there is some disturbance along the existing line due to the presence of existing access roads, the majority of the loop is within an area of largely natural vegetation. Although the majority of the loop and access road is within relatively low sensitivity areas dominated by *Acacia tortillis*, the western tip of the alignment cuts through a small hill and large *Acacia galpinii* were noted at the base of the hill (see below), which should be avoided as these are substantial trees that are ecologically significant. Although this species is not protected these are large mature specimens and as such warrant particular attention. Their location is illustrated below and measures should be implemented in the design that ensure that the buildings and access road do not result in the destruction of the trees.

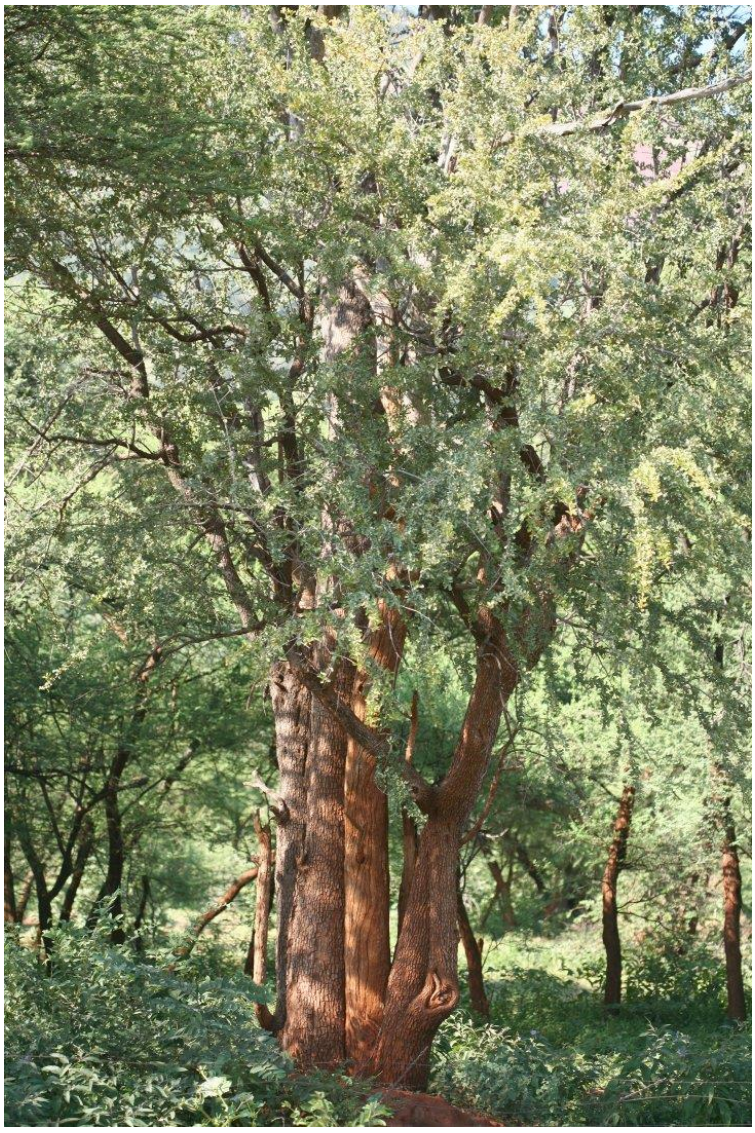
The location of the large *Acacia galpinii* trees is just to the north of the low ridge that the line cuts through.

The main issues with the siding are around faunal disturbance and threats to fauna from increased human presence on the site. Although there is disturbed vegetation along the railway, the new loop will result in the expansion of the line footprint into the adjacent intact vegetation. Dominant and characteristic species present include trees such as *Acacia tortillis*, *Zizyphus mucronata*, *Terminalia sericea*, *Combretum hereroense*, *Combretum imberbe*, *Celtis africana* and *Croton gratissimus*. Shrubs include *Grewia flava* and *Abutilon angulatum* var *angulatum*, *Hibiscus micranthus*, *Pavonia burchellii*, *Solanum delagoense* and Hermbstaedtia odorata. Common and dominant grasses include *Cenchrus ciliaris*, *Aristida bipartita*, *Enneapogon cenchroides*, *Cynodon dactylon*, *Cymbopogon pospischilii*, *Aristida congesta*, *Tragus bertonianus*, *Melinis repens* and *Heteropogon contortus*. Weedy and alien species present include Achyranthes aspera, *Bidens pilosa*, *Tribulis terrestris*, *Zinnia peruviana* and *Alternanthera pungens*. Protected species present at the site include *Boscia albitrunca* on the small hill next to the line as well as a few individuals of *Combretum imberbe*, which are close to the line but not the side of the new loop of the ablution facilities and as a result should not be affected.

The western extent of the Thabazimbi loop, showing the small hill that would be affected by the new loop, with the large *Acacia galpinii* trees visible on the right in front of the hill.

The central part of the Thabazimbi line, showing the typical bush along the line, dominated by *Acacia tortillis*.

The eastern extent of the Thabazimbi line, with *Grewia flava* prominent in the disturbed area next to the line.



The nationally protected tree *Combretum imberbe* (Leadwood) is present at the Thabazimbi site but occurs on the other side of the railway line from the proposed loop. Note that the bark is not normally so red, but has been coloured by dust from the Iron-ore mine.

3.4 CRITICAL BIODIVERSITY AREAS & BROAD SCALE ECOLOGICAL PROCESSES

The CBA map (Limpopo v2 2013) for the general area surrounding the site is depicted below in Figure 4. The Northam Loop is outside of any CBAs and the majority of the loop is within transformed areas. The Ferrogate Loop's northern end is situated in a CBA1 and runs through a short section of CBA2, while the southern section of the loop is within an ESA (Ecological Support Area). However the majority of the southern section of the loop is along the public road and is already transformed, with the result that there would be little loss of intact vegetation along this section of the loop. There are two sections of the Ferrogate loop where there is some natural vegetation remaining that would be affected by the new loop or facilities. Just to the south of the current siding there is a small rocky outcrop that would possibly be affected by the new loop, while to the north of the siding the vegetation is also largely natural and would be impacted by the loop. The total extent of habitat loss at

Ferrogate resulting from the new loop would however be very low and would not compromise the affected CBAs.

The Thabazimbi loop is situated on the border of a CBA1 and CBA2 area which probably relates to the fact that the site is located within a conservation area and is largely within natural vegetation. The total extent of habitat loss resulting from the development would amount to less than 5 ha and is not considered significant. In addition, as the development is an extension of an existing development, there are no new impacts that would result from the loop development and no novel ecological process that would be affected. There are some large *Acacia galpinii* trees in the proposed vicinity of the buildings at the Thabazimbi site and it would preferable to avoid the destruction of these trees, as they are considered ecological significant. Provided that these trees are not affected , the development is not deemed to have a long-term significant impact on the CBAs of the area and is considered acceptable in this regard.

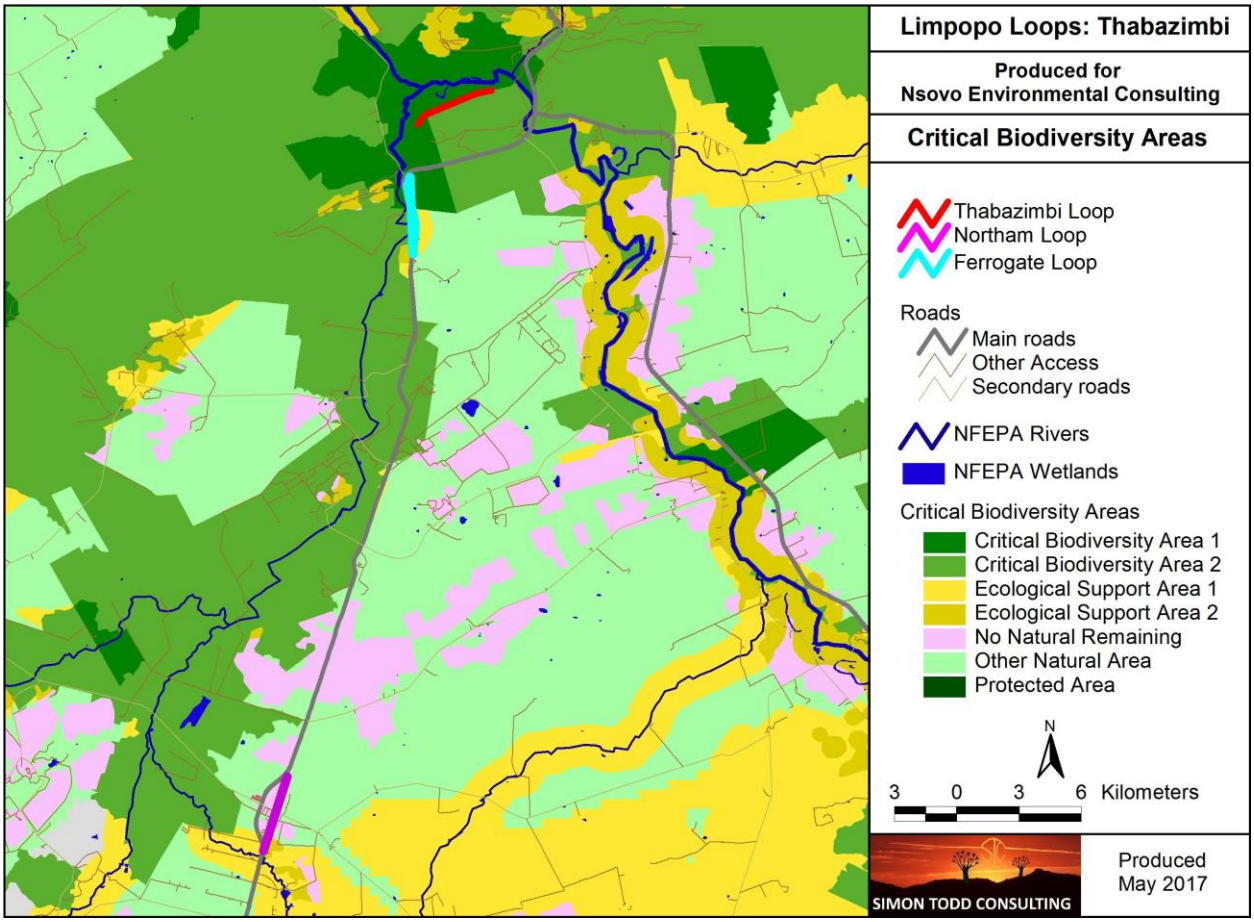


Figure 4. Critical Biodiversity Areas map of the areas around the Limpopo Loops study site.

3.5 FAUNAL COMMUNITIES

Mammals

According to the MammalMap database, 37 mammals have been recorded from the area, including a relatively large number of conservation dependent species such as Cape Mountain Zebra, Wildebeest, Sable (VU), Cheetah (VU), Giraffe, Impala and Buffalo (Appendix 1), which are maintained as part of wildlife ranching enterprises are not free-ranging in the area. As these are essentially 'farmed' species, impacts on such species are not considered. Four free-ranging species of conservation concern occur in the wider area, the Serval *Leptailurus serval* (Near Threatened), Leopard *Panthera pardus* (Vulnerable), the Brown Hyaena *Hyaena brunnea* (Near Threatened), and Ground Pangolin *Smutsia temminckii* (Vulnerable). Given the high level of human activity and transformation at Northam and Ferrogate, it is highly unlikely that any of the listed species are present at these sites. It is however likely that at some of these species are present at Thabazimbi, given the conservation-orientated land use at the site. Although no evidence of these listed species were observed on-site at Thabazimbi, they typically occur at a low density and would require specific long-term monitoring to evaluate their presence and density. Of these listed species the Leopard and Brown Hyaeana are most likely to occur at the site, while the habitat is not considered very favourable for the either the Serval or Pangolin, which prefer grassy and more sandy areas respectively. However, the extent of habitat loss at the Thabazimbi site would not be significant even at a local level and major potential threat would be from increased human presence at the site, which could lead to higher risk of poaching and similar threat. Provided that this impact can be managed, then the overall impact of the development of the loops on mammals would be low.

Reptiles

According to the ReptileMap database, 33 reptile species have been recorded from the broad area around the loops (Annex 2). The composition of the reptile fauna is likely to comprise 2 tortoises, 1 chamaeleon, 16 snakes, 10 lizards and skinks and 4 geckos. There are no listed species which are known to occur in the area. Habitats of above-average significance for reptiles would be the rocky hills present at Ferrogate and Thabazimbi. The overall extent of habitat loss in these and other natural habitats would be low. In addition, as there is already a railway line present at each site, and sensitive species are likely to have already moved away from the line and the additional loop is not likely to generate significant impact on reptiles. The major impact associated with the development would be a small amount of habitat loss at each loop, but no long-term significant impacts are expected to occur.

Amphibians

Twelve frog species are known from the area (Annex 3), but only a small proportion of these would be likely to occur within the affected areas. No listed species are known from the area. Although there are some drainage lines which would be of significance for amphibians in the vicinity of the Ferrogate and Thabazimbi loops, there is little that would be affected by the loops themselves. Amphibians would potentially suffer from fragmentation of habitat due to the presence of the line, but as the new loops will have culverts at places where water is likely to move, these can be used by frogs and it is not likely that they would be affected by the presence of the loops themselves. The major threat to amphibians would likely result from any pollution and spills of petrochemicals such as diesel or oil at the sidings, which may enter the drainage systems and affect amphibians.

3.6 SITE SENSITIVITY ASSESSMENT

The sensitivity map of each of the loops is illustrated below (Figure 5). The Northam loop is considered mostly low sensitivity on account of the prevalence of transformed areas at this site. The northern part of the loop is however considered to be Medium sensitivity and is largely natural vegetation with few species of concern present. The Ferrogate loop consists of alternating Medium and Low sensitivity areas. There are disturbed habitats present along the existing siding as well as the southern section adjacent to the R510, while the remaining areas are intact bushveld considered to be of Medium sensitivity. The Thabazimbi loop is considered mostly Medium sensitivity with the area around the rocky ridge considered High sensitivity on account of the presence of the ridge as well as some large trees in this area. The major impact at this site is however from increased human presence rather than habitat loss as a result of the current development.

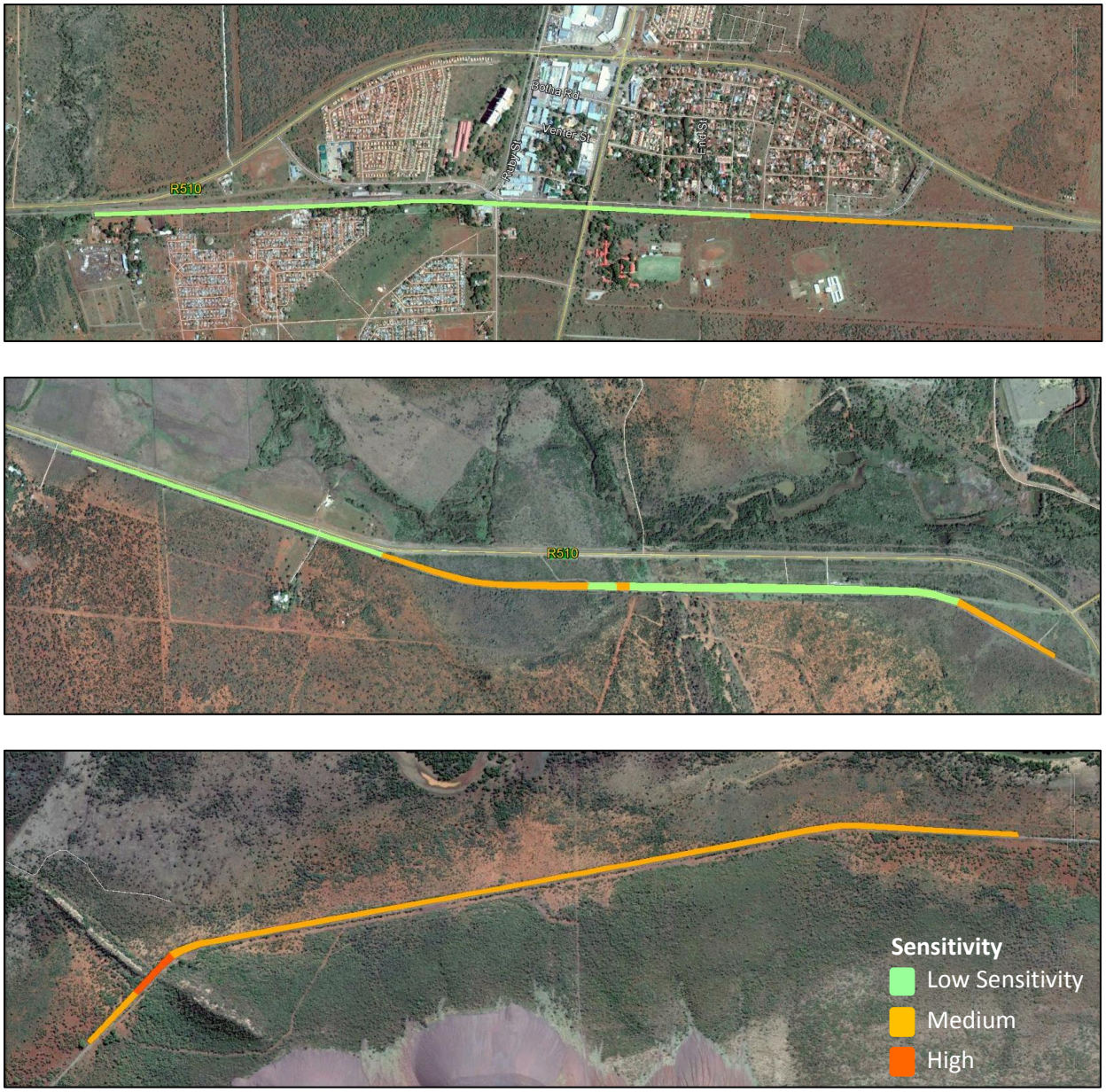


Figure 5. Ecological sensitivity map of the study areas with Northam, Ferrogate and Thabazimbi from top to bottom.

4 IDENTIFICATION & NATURE OF IMPACTS

4.1 IMPACT RISK FACTORS

Potential ecological impacts resulting from the development of the Waterberg Stage 2-5 Limpopo Loops would stem from a variety of different activities and risk factors associated

with the preconstruction, construction and operational phases of the project potentially including the following:

Construction Phase

- Vegetation clearing for access roads, the railway loops and required buildings itself may impact intact vegetation. In addition, the site visit confirmed the presence of several protected tree species at the sites and some of these could be lost as a result of the development.
- Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Slower types such as tortoises, snakes and amphibians would be most susceptible and the impact would be largely concentrated to the construction phase when vehicle activity is expected to be high. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

Operational Phase

- The operation of the facility will generate some noise and disturbance which may impact some fauna.

Cumulative Impacts

- The development of the Thabazimbi and Ferrogate Loops occur within CBAs and could contribute to the cumulative fragmentation of the landscape and loss of habitat.

4.2 ASSESSMENT METHODOLOGY

Direct, indirect and cumulative impacts of the issues identified above, are assessed according to the following standard methodology:

- The **nature** which shall include a description of what causes the effect what will be affected and how it will be affected.
- 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):

- The **duration** wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0- 1 years).
  - the lifetime of the impact will be of a short duration (2-5 years).
  - medium-term (5-15 years).

- long term (> 15 years); or
- permanent

- The **magnitude** quantified as small and will have no effect on the environment, minor and will not result in an impact on processes, low and will cause a slight impact on processes, moderate and will result in processes continuing but in a modified way, high (processes are altered to the extent that they temporarily cease) and very high and results in complete destruction of patterns and permanent cessation of processes.

- The **probability** of occurrence, which shall describe the (likelihood of the impact actually occurring. Probability will be estimated as very improbable (probably will not happen), improbable (some possibility, but of low likelihood), probable (distinct possibility), highly probable (most likely) and definite (impact will occur regardless of any prevention measures).

  The **significance** which shall be determined through a synthesis of the characteristics described above and will be assessed as follows:

  - **No significance**: the impacts do not influence the proposed development and/or environment in any way.

  - **Low significance**: the impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation.

  - **Moderate significance**: the impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures.

  - **High significance**: the impacts will have a major influence on the proposed development and/or environment and will result in the "no-go" option on the development or portions of the development regardless of any mitigation measures that could be implemented. This level of significance must be well motivated.

  and;

  - the status, which will be described as either positive, negative or neutral.
  - the degree to which the impact can be reversed.
  - the degree to which the impact may cause irreplaceable loss of resources.
  - the degree to which the impact can be mitigated.

5 IMPACT ASSESSMENT

The likely impacts on the terrestrial ecology of the site resulting from the development of the Limpopo Loops are identified and discussed below with reference to the characteristics and features of the site, for each site individually.

5.1 CONSTRUCTION PHASE IMPACTS

Impacts on vegetation and protected plant species

Although large parts of the Northam and Ferrogate loops are within disturbed areas, some vegetation loss will occur regardless of mitigation and avoidance at each site. Although there are some protected tree species present, their density is low and impacts on such species may occur but would be expected to be low and not of broader significance.

Issue	Site	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Impacts on Vegetation and Protected Plants species During Construction	Thabazimbi Loop	No	Negative	1	4	3	4	32 = Medium-Low
		Yes	Negative	1	4	2	2	14 = Low
	Ferrogate Loop	No	Negative	1	4	3	4	32 = Medium-Low
		Yes	Negative	1	4	3	2	14 = Low
	Northam Loop	No	Negative	1	4	2	4	28 = Low
		Yes	Negative	1	4	1	2	12 = Low
Corrective Actions	• The footprint should be restricted as far as possible to existing transformed areas. • Existing roads for access and construction should be used as far as possible. • No open cooking or heating fires should be allowed as there is a significant risk of runaway fires at all sites.							

Faunal Impacts During Construction

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna resident or utilising the site. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals, like Pangolins, and reptiles would also be vulnerable to illegal collection or poaching.

Issue	Site	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Faunal Impacts During Construction	Thabazimbi Loop	No	Negative	1	2	4	4	28 = Low
		Yes	Negative	1	1	3	3	15 = Low
	Ferrogate Loop	No	Negative	1	1	4	4	24 = Low
		Yes	Negative	1	1	3	3	15 = Low
	Northam Loop	No	Negative	1	1	2	4	16 = Low
		Yes	Negative	1	1	2	3	12 = Low
Corrective Actions	• Any fauna threatened by construction activities should be removed to safety by the ECO or other suitably qualified person. • During construction all vehicles should adhere to demarcated tracks or roads and the speed limit should not exceed 40km/h on larger roads and should be 20-30km/h on smaller access tracks. • All construction staff should undergo environmental induction before construction commences in order to raise awareness and reduce potential faunal impacts. Poaching should be prohibited and monitored. • All spills of hazardous material should be cleared in the appropriate manner according to the nature and identity of the spill and all contaminated soil removed from the site. • Unnecessary disturbance to sensitive faunal habitats such as drainage lines and wetlands should minimised as much as possible. • All personnel must remain within a demarcated construction area and may not wander into the veld. • Toilets should be provided on-site during construction. • No food or similar waste that may attract wild animals should be disposed of at the sites. All food and litter waste should be placed in sealed bins and removed from the site each day.						

5.2 OPERATIONAL PHASE IMPACTS

Faunal Impacts during Operation

During the operational phase of the development, impacts on fauna are likely to be caused by the presence of humans and operating trains.

Issue	Site	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Faunal Impacts During Operation	Thabazimbi Loop	No	Negative	1	3	3	3	21 = Low
		Yes	Negative	1	2	2	2	10 = Low
	Ferrogate Loop	No	Negative	1	2	3	3	18 = Low
		Yes	Negative	1	2	2	2	10 = Low
	Northam Loop	No	Negative	1	2	2	2	10 = Low
		Yes	Negative	1	2	1	1	4 = Low
Corrective Actions	• Any fauna threatened by operational activities should be removed to safety by a suitably qualified person. • All operational staff should undergo environmental induction before construction commences in order to raise awareness and reduce potential faunal impacts. • No personnel to wander from the site into the veld under any circumstances. • All waste generated at the sites should be kept in scavenger proof bins and removed from site at regular intervals. • If the loops must be lit at night, this should be with downward-directed LED-type lights that do not attract insects.							

5.3 CUMULATIVE IMPACTS

Cumulative impacts on CBAs and landscape connectivity

The location of two of the sites in CBAS could result in a loss in broad-scale landscape connectivity and habitat loss. There could be loss of connectivity given the presence of existing railway lines and roads in the vicinity.

Issue	**Site**	**Corrective measures**	**Impact rating criteria**					**Significance**
			Nature	**Extent**	**Duration**	**Magnitude**	**Probability**	
Impacts on Vegetation and Protected Plants species During Construction	Thabazimbi Loop	No	Negative	1	4	3	3	24 = Medium-Low
		Yes	Negative	1	4	2	2	14 = Low
	Ferrogate Loop	No	Negative	1	4	2	3	21 = Medium-Low
		Yes	Negative	1	4	2	2	14 = Low
	Northam Loop	No	Negative	1	4	1	2	12 = Low
		Yes	Negative	1	4	1	1	6 = Low
Corrective Actions	• The footprint should be restricted as far as possible to existing transformed areas. • Minimise development within the High sensitivity parts of the site and where disturbance to such areas is unavoidable due to roads etc. they should be rehabilitated and reshaped to natural contours. • The development footprint should be kept to a minimum and natural vegetation should be encouraged to regenerate in disturbed areas. • Avoid impact on corridors such as the riparian corridors associated with the larger drainage lines within the area.							

6 CONCLUSIONS & RECOMMENDATIONS

There are no major impacts that are likely to be associated with the development of any of the three proposed loops with associated infrastructure. The primary factor resulting in relatively low ecological impacts, is the presence of the existing line and disturbance within the affected areas. The additional loops are not likely to generate any new impacts that are not already present. Although the severity of some impacts may increase as a result of the larger local footprint of the line and the increased human presence on site, these impacts can be mitigated to acceptable levels. The site visit confirmed that there are some protected tree species present at the Ferrogate and Thabazimbi sites, but these are likely to be outside of the development footprint and the numbers potentially affected is low and even at a local level, a significant impact on these species is not likely. If any individuals of these tree species need to be destroyed, it will be necessary to acquire a permit from the provincial nature conservation authorities, Department of Economic Development, Environment and Tourism[2].

The major impacts on fauna are likely to occur during the construction phase due to the increased human presence at the sites as well as the operation of heavy machinery. This will however be temporary, no RDB species are likely to be impacted, and in the longer term impact on fauna would be low. The location of the Thabazimbi loop within a conservation area is however a concern and the increased human presence within the nature reserve will pose a long-term risk to fauna through poaching, fires and similar anthropogenic impacts. With mitigation and regulation of human activity at this site, it is likely that these impacts can be reduced to an acceptable level.

Overall, there are no impacts associated with the development of any of the three loops that cannot be reduced to a manageable level through mitigation. As such, there are no reasons from a terrestrial ecology perspective that the development should not proceed.

[2] http://www.ledet.gov.za/wp-content/uploads/2016/10/CONTACT-DETAILS-OF-OFFICERS-AND-SERVICE-CENTRES-FOR-WILDLIFE-TARDE-AND-REGULATION-2.pdf

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ANNEX 1. LIST OF MAMMALS

List of mammals which have been recorded in the region of the Limpopo Loops site. Few of these species would actually occur at the site due to the high degree of transformation the area and the sites themselves have experienced.

Family	*Genus*	*Species*	*Subspecies*	Common name	Red list category	No. records
Bovidae	*Raphicerus*	*campestris*		Steenbok	Least Concern	2
Bovidae	*Sylvicapra*	*grimmia*		Bush Duiker	Least Concern	5
Bovidae	*Tragelaphus*	*strepsiceros*		Greater Kudu	Least Concern	40
Canidae	*Canis*	*mesomelas*		Black-backed Jackal	Least Concern	6
Canidae	*Otocyon*	*megalotis*		Bat-eared Fox	Least Concern	2
Cercopithecidae	*Chlorocebus*	*pygerythrus*		Vervet Monkey	Least Concern	1
Cercopithecidae	*Papio*	*ursinus*		Chacma Baboon	Least Concern	3
Felidae	*Caracal*	*caracal*		Caracal	Least Concern	2
Felidae	*Leptailurus*	*serval*		Serval	Near Threatened	2
Felidae	*Panthera*	*pardus*		Leopard	Vulnerable	21
Hyaenidae	*Hyaena*	*brunnea*		Brown Hyaena	Near Threatened	5
Hyaenidae	*Proteles*	*cristata*		Aardwolf	Least Concern	4
Manidae	*Smutsia*	*temminckii*		Ground Pangolin	Vulnerable	1
Muridae	*Mastomys*	*natalensis*		Natal Mastomys	Least Concern	1
Mustelidae	*Mellivora*	*capensis*		Honey Badger	Least Concern	5
Nesomyidae	*Saccostomus*	*campestris*		Southern African Pouched Mouse	Least Concern	1
Orycteropodidae	*Orycteropus*	*afer*		Aardvark	Least Concern	1
Pedetidae	*Pedetes*	*capensis*		South African Spring Hare	Least Concern	1
Rhinolophidae	*Rhinolophus*	*simulator*		Bushveld Horseshoe Bat	Least Concern	1
Sciuridae	*Paraxerus*	*cepapi*		Smith's Bush Squirrel	Least Concern	1
Suidae	*Phacochoerus*	*africanus*		Common Wart-hog	Least Concern	70
Vespertilionidae	*Myotis*	*tricolor*		Temminck's Myotis	Least Concern	1
Viveridae	*Genetta*	*maculata*		Common Large-spotted Genet (Rusty-spotted Genet)	Least Concern	1
Viverridae	*Civettictis*	*civetta*		African Civet	Least Concern	1
Conservation-dependent mammals						

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Bovidae	*Aepyceros*	*melampus*		Impala	Least Concern	50
Bovidae	*Alcelaphus*	*buselaphus*		Hartebeest	Not listed	10
Bovidae	*Connochaetes*	*gnou*		Black Wildebeest	Least Concern	25
Bovidae	*Connochaetes*	*taurinus*	*taurinus*	Blue Wildebeest	Least Concern	9
Bovidae	*Damaliscus*	*lunatus*		Common Tsessebe	Least Concern (IUCN 2008)	36
Bovidae	*Hippotragus*	*niger*	*niger*	Sable	Vulnerable	6
Bovidae	*Oryx*	*gazella*		Gemsbok	Least Concern	1
Bovidae	*Syncerus*	*caffer*		African Buffalo	Least Concern	1
Bovidae	*Tragelaphus*	*angasii*		Nyala	Least Concern	1
Bovidae	*Tragelaphus*	*scriptus*		Bushbuck	Least Concern	1
Equidae	*Equus*	*quagga*		Plains Zebra	Not listed	17
Felidae	*Acinonyx*	*jubatus*		Cheetah	Vulnerable	4
Giraffidae	*Giraffa*	*camelopardalis*	*giraffa*	The South African Giraffe	Least Concern	2

ANNEX 2. LIST OF REPTILES

List of reptiles which are likely to occur in the vicinity of the Limpopo Loops study area. Conservation status is from Bates et al. (2014).

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Agamidae	*Acanthocercus*	*atricollis*	*atricollis*	Southern Tree Agama	Least Concern	3
Chamaeleonidae	*Chamaeleo*	*dilepis*	*dilepis*	Common Flap-neck Chameleon	Least Concern	4
Colubridae	*Crotaphopeltis*	*hotamboeia*		Red-lipped Snake	Least Concern	1
Colubridae	*Dasypeltis*	*scabra*		Rhombic Egg-eater	Least Concern	2
Colubridae	*Dispholidus*	*typus*	*viridis*	Northern Boomslang	Not evaluated	1
Colubridae	*Philothamnus*	*semivariegatus*		Spotted Bush Snake	Least Concern	2
Colubridae	*Telescopus*	*semiannulatus*	*semiannulatus*	Eastern Tiger Snake	Least Concern	1
Cordylidae	*Cordylus*	*vittifer*		Common Girdled Lizard	Least Concern	3
Elapidae	*Dendroaspis*	*polylepis*		Black Mamba	Least Concern	2
Elapidae	*Naja*	*annulifera*		Snouted Cobra	Least Concern	4
Elapidae	*Naja*	*mossambica*		Mozambique Spitting Cobra	Least Concern	5
Gekkonidae	*Chondrodactylus*	*turneri*		Turner's Gecko	Least Concern	1
Gekkonidae	*Hemidactylus*	*mabouia*		Common Tropical House Gecko	Least Concern	5
Gekkonidae	*Homopholis*	*arnoldi*		Arnold's Velvet Gecko	Not evaluated	1
Gekkonidae	*Lygodactylus*	*capensis*	*capensis*	Common Dwarf Gecko	Least Concern	5
Gerrhosauridae	*Gerrhosaurus*	*flavigularis*		Yellow-throated Plated Lizard	Least Concern	2
Gerrhosauridae	*Matobosaurus*	*validus*		Common Giant Plated Lizard	Least Concern	3
Lacertidae	*Nucras*	*holubi*		Holub's Sandveld Lizard	Least Concern	1
Lamprophiidae	*Amblyodipsas*	*polylepis*	*polylepis*	Common Purple-glossed Snake	Least Concern	1
Lamprophiidae	*Boaedon*	*capensis*		Brown House Snake	Least Concern	2
Lamprophiidae	*Gonionotophis*	*nyassae*		Black File Snake	Least Concern	1
Lamprophiidae	*Psammophis*	*brevirostris*		Short-snouted Grass Snake	Least Concern	1
Lamprophiidae	*Psammophis*	*subtaeniatus*		Western Yellow-bellied Sand Snake	Least Concern	2
Lamprophiidae	*Pseudaspis*	*cana*		Mole Snake	Least Concern	2
Leptotyphlopidae	*Leptotyphlops*	*scutifrons*	*scutifrons*	Peters' Thread Snake	Not listed	2
Scincidae	*Mochlus*	*sundevallii*	*sundevallii*	Sundevall's Writhing Skink	Least Concern	1
Scincidae	*Trachylepis*	*capensis*		Cape Skink	Least Concern	1
Scincidae	*Trachylepis*	*punctatissima*		Speckled Rock Skink	Least Concern	6
Scincidae	*Trachylepis*	*varia*		Variable Skink	Least Concern	7
Testudinidae	*Kinixys*	*lobatsiana*		Lobatse Hinged Tortoise	Least Concern	1
Testudinidae	*Stigmochelys*	*pardalis*		Leopard Tortoise	Least Concern	1
Varanidae	*Varanus*	*albigularis*	*albigularis*	Rock Monitor	Least Concern	3
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern	9

ANNEX 3. LIST OF AMPHIBIANS

List of amphibians which are likely to occur in the vicinity of the Limpopo Loops study site.

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Brevicepitidae	*Breviceps*	*adspersus*		Bushveld Rain Frog	Least Concern	1
Bufonidae	*Schismaderma*	*carens*		Red Toad	Least Concern	9
Bufonidae	*Sclerophrys*	*garmani*		Olive Toad	Least Concern	9
Hyperoliidae	*Kassina*	*senegalensis*		Bubbling Kassina	Least Concern	11
Microhylidae	*Phrynomantis*	*bifasciatus*		Banded Rubber Frog	Least Concern	10
Phrynobatrachidae	*Phrynobatrachus*	*natalensis*		Snoring Puddle Frog	Least Concern	3
Ptychadenidae	*Ptychadena*	*anchietae*		Plain Grass Frog	Least Concern	6
Ptychadenidae	*Ptychadena*	*mossambica*		Broadbanded Grass Frog	Least Concern	6
Pyxicephalidae	*Cacosternum*	*boettgeri*		Common Caco	Least Concern	5
Pyxicephalidae	*Pyxicephalus*	*edulis*		African Bull Frog	Least Concern	2
Pyxicephalidae	*Tomopterna*	*cryptotis*		Tremelo Sand Frog	Least Concern	7
Rhacophoridae	*Chiromantis*	*xerampelina*		Southern Foam Nest Frog	Least Concern	6