TRANSNET

ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROPOSED NEW OVERVAAL TUNNEL ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME, MSUKALIGWA LOCAL MUNICIPALITY, MPUMALANGA PROVINCE

EIMS REF: 0963

DEA REF: 14/12/16/3/3/3/101

JUNE 2015

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PROPOSED NEW OVERVAAL TUNNEL

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DOCUMENT CONTROL

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REVISION AND AMENDMENTS

Date	No.	Description Of Revision Or Amendment
2015/06/19	0	Draft Environmental impact Assessment Report

SUMMARY DATA

SUMMARY DATA	
Proposed Project:	Transnet Richards Bay Coal Line: Proposed New Overvaal Tunnel, within Msukaligwa Local Municipality, Mpumalanga Province.
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1. EXECUTIVE SUMMARY

Transnet has identified the need to construct a new railway tunnel (hereafter referred to as the proposed project) parallel to, and approximately 20m south of, the existing Overvaal single railway line tunnel, in Mpumalanga Province. The proposed project will be located on the Transnet Richards Bay Coal Line, approximately 30km south east of Ermelo. The proposed new tunnel will be approximately 3 994 metres in length, commencing at Chainage 24 870 in the west and exiting at Chainage 28 766.4 in the east. The existing and proposed tunnels are situated in an area that is characterised by a rolling to undulating topography. Well defined, localised drainage channels occur along the route and drain in a north easterly direction. The general surface elevation along the tunnel ranges from 1641 mamsl to 1656 mamsl (metres above mean sea level) in the west and central sections, increasing to approximately 1665 mamsl at the N2, and then decreasing rapidly to 1590 mamsl eastwards.

The proposed project is listed as an activity which requires an Environmental Authorisation (EA) from the relevant Competent Authority (CA), under the provisions of Section 24 of the National Environmental Management Act (Act 107 of 1998) (NEMA). Environmental Impact Management Services (Pty) Ltd (EIMS) has been appointed by Transnet SOC Limited as the Independent Environmental Assessment Practitioner (EAP) to undertake the necessary Environmental Impact Assessment (EIA) process required in order to apply for the EA.

An application for EA was submitted to the designated CA, namely the National Department of Environmental Affairs (DEA), in October 2013. Typically the EIA process can be separated into two distinct phases, namely, Scoping phase and EIA phase. Final Scoping Report (FSR) and the Plan of Study for Environmental Impact Assessment were submitted to the CA in January 2015 and the acceptance letter (please refer to table below) was received in April 2015 instructing EIMS and the applicant to continue with the EIA phase in accordance with the plan of study that was outlined in the scoping report. The primary aim of scoping was to undertake a preliminary assessment of how the proposed project is likely to interact with the specific characteristics of the receiving environment. The outcomes of scoping process was a list of potential impacts and the identification of suitable feasible alternatives which require further investigation and assessment in the current EIA phase.

A key aspect of an EIA is the need to inform and consult with the relevant receiving communities, key authorities, organisations and the general public in order to ensure a thorough and comprehensive process. A Public Participation Process (PPP), based on the requirements of Section 54 (c) of GN R543 promulgated under the National Environmental Management Act, is ongoing. The PPP involved identifying I&APs, notifying them about the application, soliciting their issues and concerns with regards to the proposed project activities, and finally to communicate the findings of the study. The public will be afforded the opportunity to review and comment on this Environmental Impact Assessment Report (EIAR) and will be involved throughout the entire EIA process. The issues and concerns identified in the public participation process to date include the following categories:

- Registration/ participation;
- Fauna;
- Eskom specific issues;

- Acknowledgement of initial notification;
- Requests for information;
- Employment issues;
- Property/ land issues;
- Safety and security concerns;
- Water issues;
- Impact on existing infrastructure;
- Compensation;
- Skills development;
- Waste management;
- Community benefits;
- Health and safety;
- Dust pollution;
- Palaeontology and heritage;
- Acknowledgement of Draft Scoping Report notification;
- Meeting arrangements; and
- General issues.

The concerns raised during the Scoping phase focus group and public meetings as well as through continued correspondence with I&APs to date is presented in the IRR and the associated meeting minutes. All comments, queries, concerns received thus far have been responded to as per the contents of the IRR and meeting minutes.

The following specialist studies have been conducted and their findings have been used to inform this EIA report.

- Ecological Impact Assessment;
- Hydrological and Hydrogeological Impact Assessment;
- Wetland Impact Assessment;
- Paleontological assessment;
- Heritage Impact Assessment; and
- Noise and Vibration Impact Assessment.

The receiving environment has the following key environmental sensitivities that were considered in this EIAR:

- The study area transects the vulnerable Eastern Highveld Grassland and the least concern Wakkerstroom Montane Grassland and it is considered potential location of sensitive flora (includes vegetation units classified as Endangered and Less Threatened);
- The presences of ten provincially protected species had been confirmed, as well as the habitat suitability of at least one threatened Red Data plant, *Gladiolus malvinus*. The study area includes the usual variations of faunal habitat found throughout most of the Mesic Highveld Grassland Bioregion (pers. obs.). Disturbed primary vegetation, secondary vegetation and transformed areas are commonly found commonly in the southern parts of Mpumalanga.

- According to the hydrocensus survey conducted by GCS a total of 18 sensitive receptors were identified within 2km radius around the proposed tunnel area, only eight sensitive receptors are at medium risk to be impacted upon by the proposed tunnel project. These eight (8) receptors consist out of four production boreholes (OHP7, OHP8, OHP9 and OHP12) and four (4) natural springs (OHP5, OHP10, OHP11, OHP18). Based on the investigation most groundwater users abstract from the weather aquifers with the exception of a primary school production borehole OHP13 which is drilled into the deeper fractured bedrock aquifer. Most of the groundwater qualities have a neutral pH and have low Electrical Conductivity (EC) and Total Dissolved Solids (TDS) concentrations, except for OHP6 which is slightly acidic (pH value 5.84). Mostly all the metal parameters falls within the SANS 241-1: 2011 Water Quality Standards, except for the OHP10, OHP14 and OHP17, which manganese concentration (0.443mg/l and 0.095mg/l), and iron concentrations (4.54mg/l, 0.569mg/l and 0.609mg/l) exceeded the SANS Water Quality Standards (refer to the attached Hydrogeological specialist report).
- Most of the groundwater qualities have a neutral pH and have low Electrical Conductivity (EC) and Total Dissolved Solids (TDS) concentrations, and it is suitable for human consumption;
- Numerous wetlands, which constitute a sensitive habitat, are found within proposed project study area and the surrounding (refer to the attached wetland impact assessment report);
- The Present Ecological State (PES) of delineated watercourses assessed in the Inkomati – Usuthu WMA (used to be called Usuthu - Mhlathuze WMA) range from Largely natural (Class B PES) to Largely modified/ Seriously modified (Class D/E PES). The majority of the watercourses have a Moderately modified (Class C) PES or worse (only a single watercourse with a Class B PES is present). The Ecological Importance and Sensitivity (EIS) values range from Moderate/ Low to High.
- The Present Ecological State (PES) of delineated wetlands assessed in the Upper Vaal WMA range from Pristine/ Largely natural (Class A/B PES) to Seriously modified/ Critically modified (Class E/F PES). The seep and unchannelled valley bottom wetlands located above the proposed new Overvaal Tunnel are is the best overall condition, with PES values that range from A/B to B/C. The Ecological Importance and Sensitivity (EIS) of the same three wetlands have a Very high value, while remaining wetlands range between Very high to Moderate.
- According to the Surface water specialist, there is a potential for impacts to water quality of water resources during the project as a result of the following key impacting processes:
    - An increase in suspended sediments due to removal of vegetation and the disturbance in catchment areas (e.g. cutting areas, new access roads, and stockpile areas);
    - The release of toxicants (oils, greases and other chemicals) by machinery or the failure to adhere to EMP measures. Coal will be transported by the rail passing through the proposed new tunnel and may be classified as a hazardous material if it were to contaminate surrounding soil and water.

- The proposed project falls within rocky ridge and wetland areas that are deemed to be of high sensitivity as they provide potential habitat and migratory connectivity for faunal species as well as the potential to host a higher diversity of floral species;
- According to the ecological importance classification for the two quaternary catchments (C11B and W53A) in the area, the systems can be classified as sensitive to moderately sensitive in terms of ecological importance and sensitivity;
- The assessment shows that construction noise at all Noise Sensitive Areas has an Environmental Significance Rating of “Low” i.e. where this impact would not have a direct influence on the decision to develop in the area;
- The assessment shows that construction vibration (both blasting and tunnel boring) has an Environmental Significance Rating of “Low” i.e. where this impact would not have a direct influence on the decision to develop in the area;
- A number of heritage features exist within the proposed project site; and
- The groundwater resources are of drinking water standard.

Impacts were identified during scoping and those impacts which were likely to have a significant impact were assessed for significance in this EIAR.

Majority of the identified and assessed impacts have low to medium significance provided that the suggested mitigation measures are implemented during all phases of the proposed development. Of the impacts assessed the following impacts were identified as having a MEDIUM significance, post mitigation (please refer to **Table 29**):

- Lowering and maintaining of lowered groundwater levels;
- Pollution and alteration of water resource dynamic;
- Pollution/ contamination of water resources;
- Alteration of water resource dynamic;
- Destruction of species of concern;
- Loss of Watercourse Habitat;
- Employment creation;
- Erosion;

None of the identified and assessed impacts have HIGH significance after implementation of suggested mitigation measures; however *loss of watercourse habitat* and *alteration of water resource dynamic* impacts where recorded as high following consideration of the “prioritisation factor”.

Various alternatives were identified and the feasible alternatives comparatively assessed, with the following alternatives being recommended for authorisation:

- Construction of the new double railway line tunnel approximately 20m south of, the existing Overvaal single tunnel- as per the footprint indicated in Appendix C;
- Relocation of temporary construction camp for eastern portal to avoid an identified heritage feature;
- Stockpile area 2 and 11 considered more preferable than the others assessed;
- The location of construction phase workers accommodation within the nearby towns (Sheepmoore; Ermelo; etc); and
- The Drill and Blast option is therefore suited to the conditions and requirements of the proposed project (Tunnel construction). Based on the evaluation undertaken by the Engineers and comparison of advantages and disadvantages of both options (please refer to Table 32 and Table 33), **Drill and Blast construction method** is recommended as the most preferred method to use during the excavation of the proposed tunnel.

An important consideration is that whilst Stockpile area 2 is identified as one of the 2 preferred areas, there remain certain environmental sensitivities which need to be managed and mitigated. One of the key aspects is the fact that Area 2 encompasses certain identified heritage features. As per the recommendations of the heritage specialist these areas must be excluded from the site to be utilised for stockpiling.

Numerous potential impacts that may occur during the lifecycle of the proposed project have been identified. TABLE 1 below present the list of identified and assessed impacts.

TABLE 1: IMPACT SUMMARY.

Development Phase	Impact
Construction	Nuisance from dust and noise
	Visual intrusion
	Increased pressure on existing infrastructure.
	Increase in the spread of diseases (including sexually transmitted diseases and HIV/AIDS).
	Impact on sense of place.
	Traffic congestion and pavement damage.
	Loss of land capability (agricultural potential) and disruption of farming activities.
	Potential markets for informal trading
	Employment creation

	Potential effect on tourism and eco-tourism
	Potential increase in stock theft
	Disruption to infrastructure and services
	Impacts of vibration
	Impact on historical and cultural sites (e.g. archaeological sites, historical sites, graves and cemeteries).
	Dust settlement impact on plants
	Impact on habitat of threatened animals
	Impact on threatened plants
	Impact on protected species
	Impact on indigenous natural vegetation
	Impact on wetlands
	Establishment and spread of Listed Invasive Plant Species
	Sedimentation
	Alteration of watercourse dynamics.
	Impacts of water use on resource sustainability.
	Pollution of water resources
	Geological Instability
	Waste management and disposal
	Impacts on the safety and security of neighbouring/surrounding settlements
	Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer.
	Increase bedrock fracturing and opening of fractures / faults connecting the shallow weathered aquifer and deeper fractured bedrock aquifer (If drill and blast method is used)
	Surface water contamination (as a secondary effect to groundwater contamination)
	Off road driving beyond the development footprint

	Re-establishment of regionally indigenous species in rehabilitated areas
	Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)
Operation	Impact on sense of place
	Impact on current land-use
	Alteration of watercourse dynamics
	Impacts of Erosion
	Pollution of water resources
	Loss of land capability (agricultural potential)

This EIA report will be submitted to the DEA for review and decision making. The key tasks covered during the EIA phase include:

- Specialist investigations;
- Ongoing public consultation;
- Assessment of the significance of the impacts identified in this scoping report;
- Comparative assessment of the identified alternatives to identify the most suitable proposal; and
- Identification of relevant management and mitigation measures that should be implemented should the proposed project be approved.

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List of Abbreviations

BID	Background Information Document
BID	Background Information Document
CA	Competent Authority
CV	Curriculum Vitae
DALA	Department of Agriculture and Land Administration
DLA	Department of Land Administration
DPLG	Department of Provincial and Local Government
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIMS	Environmental Impact Management Services (Pty) Ltd
EMC	Environmental Monitoring Committee
EMPr	Environmental Management Programme
ER	Environmental Risk
FSR	Final Scoping Report
GIS	Geographical Information System
GVA-R	Gross Value Added by Region
GSDM	Gert Sibande District Municipality
GN	Government Notice
HIA	Heritage Impact Assessment
IUCN	International Union for Conservation of Nature
IWMP	Integrated Waste Management Plan
I&AP	Interested and Affected Party
IRR	Issues and Responses Report
LN	Listing Notice
MDEDET	Mpumalanga Department of Economic Development, Environment and Tourism
MDARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
MLM	Msukaligwa Local Municipality
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NWA	National Water Act (Act No. 36 of 1998)
OHTE	Overhead Track Equipment
PoS	Plan of Study
PPP	Public participation process
RDL	Red Data List
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SOC	State Owned Company
SR	Scoping Report
TBM	Tunnel Boring Machine
VSA's	Vibration Sensitive Areas
WUL	Water Use Licence

2. INTRODUCTION AND MOTIVATION

Transnet SOC Limited (the Applicant) requested Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake the necessary steps to prepare and submit an application for environmental authorisation (EA) to the competent authority (CA), the National Department of Environmental Affairs (DEA), for the Transnet Richards Bay Coal Line: Proposed New Overvaal Tunnel (hereafter referred as the proposed project), within Msukaligwa Local Municipality, Mpumalanga Province. The proposed project is part of Transnet's expansion programme to increase the capacity of the Transnet Richards Bay Coal Line. The existing Overvaal tunnel is the only place on the entire coal line where the railway line is single, thus creating a bottleneck. The main reason for this proposed project is to eliminate the risk of the single tunnel. Furthermore, the proposed project is aimed on improving turn-around times, thereby increasing freight handling to, and from the Port of Richards Bay.

2.1. Need and Motivation for the proposed Project

Transnet is the largest and most crucial part of the freight logistics chain that delivers goods across South Africa. Transnet delivers thousands of tons of goods around South Africa through its rail networks both to and from its ports.

The existing Overvaal Tunnel, was completed in 1976, and is situated in Mpumalanga, between Ermelo and Piet Retief on the Richards Bay Coal Line. The line has a stretch of single track on the edge of the escarpment at Overvaal, where there is only one tunnel on the single track. Approximately 40 percent of all rail freight in South Africa passes through this single track Overvaal Tunnel. A significant portion of South Africa's international primary commodity exports pass through this tunnel hence its importance cannot be over-emphasized.

A derailment on the single track section or, at worst in the Overvaal Tunnel itself, would be economically disastrous and consequently much thought has been given to the solution of the problem. After investigating various options to deal with this concern, the construction of a second tunnel adjacent to the existing tunnel was found to be the preferred option.

The proposed project will cost R3.867 billion and it is anticipated to contribute the following to the country's economy through the following:

- Generation of additional GDP in the region of R3.496 billion in constant 2014/15 prices; of which just over 60% is generated indirectly in sectors supplying inputs to Transnet and induced in sectors affected by the payment of salaries and wages by Transnet and its suppliers. This emphasises the important role that Transnet plays as a supplier of essential logistics infrastructure to the South African economy
- Generation of additional R7.251 billion in new capital formation throughout the economy, of which R3.813 billion will be invested directly by Transnet
- Generation of 2 360 work opportunities, of which just over 846 will be for unskilled workers; thereby significantly contributing to the Government's job creation targets

- Generation of over R2 270 million additional household income, of which almost R370 million will accrue to low income households; thereby significantly contributing the Government's target of poverty alleviation, and
- Generation of additional Government revenue of just over R943 million at all three levels of government. The main sources of this government revenue will be derived from direct and indirect taxes, where direct tax consists mainly of personal income tax and company tax

2.2. Terms of Reference

According to Chapter 24 of the National Environmental Management Act (NEMA), and in an effort to give effect to the general objectives of Integrated Environmental Management, the potential consequences and impacts on the environment of certain listed activities, which are likely to have a detrimental impact on the environment, must be considered, investigated, assessed and reported on. Consequent to Chapter 5 of NEMA the Minister of Environmental Affairs (DEA), in 2010, promulgated a set of regulations relating to what activities require an EA (GNR 544, 545, and 546[1]) as well as regulations pertaining to the process (GNR 543) to be followed in terms of considering, investigating, assessing and reporting on potential environmental impacts these activities may have. Further details regarding the specific legislative requirements pertaining to this application are presented in Section 4.

EIMS has been appointed by the applicant as the EAP for the purposes of considering, investigating, assessing and reporting on the potential environmental impacts (known as the EIA process) pertaining to the proposed project. In accordance with the EIA Regulations (GNR 543, Regulation 17) EIMS, as the EAP, must inter alia:

- Be independent;
- Have expertise in conducting EIA including knowledge of the NEMA, the regulations and any applicable guidelines;
- Perform the work relating to the application in an objective manner;
- Comply with the NEMA, the Regulations and all other applicable legislation; and
- Disclose to the applicant and the CA all material information that reasonably has or may have the potential of influencing the decision by the CA or the objectivity of the assessment and reporting.

EIMS is a private and independent environmental management consulting firm with in excess of 20 years' experience in conducting EIA's and complies with the requirements of Regulation 17 listed above

[1] It is important to note that the 2010 regulations were repealed in December 2014. However in accordance with the transitional arrangements, applications pending must be dispensed with in terms of the 2010 regulations. These transitional arrangements apply to this application.

2.3. Details of the Environmental Assessment Practitioner

The individual EAP responsible for preparing this environmental impact report is Mr Tshivhangwaho Mudau. Brief details of Mr Mudau's expertise and experience are presented in Table 2.

TABLE 2: EAP DETAILS.

Environmental Assessment Practitioner	
Full Name:	Tshivhangwaho
Surname	Mudau
Qualifications:	B. Environmental Sciences (Honours) B. Environmental Sciences
SACNASP Registration	Pr.Sci.Nat. (400214/15)
Key experience:	An Environmental Practitioner with 8 years of experience. Key experience includes: - Environmental Impact Assessments; - Project Management; - Environmental Permitting; - Environmental Management Plans; - Basic Assessments Process; - Water Use Licensing; - Environmental Compliance Monitoring; - Waste License Application; - Section 24G Rectification Applications; etc.

Please refer to Appendix A for the CV of Mr Mudau as well as the Declaration of Independence form.

An application for EA was submitted to the designated CA, namely the National Department of Environmental Affairs (DEA), in October 2013. A scoping process was conducted during the course of 2014 and the Final Scoping Report (FSR) was submitted to the DEA on the 19th of March 2015 for review and decision making. The DEA consequently approved the FSR and instructed EIMS to compile an EIAR. Please refer to **Table 3** below for DEA requirements as per the FSR acceptance letter. This EIAR serves to report on the outcomes of the required EIA phase and represents the final deliverable required for the DEA to make a final decision regarding an EA. The primary objectives of the EIA phase are:

- To address and assess the significance of issues and impacts that were identified during the Scoping phase;
- To comparatively assess the alternatives identified during the Scoping phase; and

- To formulate management and mitigation measures for inclusion in an Environmental Management Programme (EMPr).

TABLE 3: DEA REQUIREMENTS

DEA Requirements	Section on the EIAR
1. Please ensure that comments from all relevant stakeholders are submitted to the Department with the final EIAr. This includes but is not limited to the Department of Agriculture, Forestry and Fisheries (DAFF) and provincial Department of Agriculture, the Department of Water and Sanitation (DWS), the Department of Transport, the Department of Economic Development, Environment and Tourism, the Local Municipality, the District Municipality, the Department of Public Works, the South African Heritage Resources Agency (SAHRA), the Department of Energy, the Department of Mineral Resources, the South African National Roads Agency (SANRAL) the South African Civil Aviation Authority (SACAA), the Department of Rural Development and Land Reform, Birdlife SA, WESSA, EWT, SECCP of Earth Africa, Earth Africa, Endangered Wildlife Trust.	See Section 6 (Public Participation) for all comments received from stakeholders as well as proof of correspondence. Comments were received from the following stakeholders: - Mpumalanga Department of Agriculture, Rural Development and Land Affairs - Department of Rural Development and Land Reform- Spatial Development Planning - Gert Sibande District Municipality: Intern Town and Regional Planner - South African Heritage Resources Agency - Eskom Holdings SOC Limited: Land Management - Birdlife South Africa - Gert Sibande District Municipality: Municipal Health Service - Ministry of Water and Environmental Affairs - Mpumalanga Department of Economic Development, Environment and Tourism: Office of the MEC - National Department of Labour - Department of Rural Development and Land

		Reform: Deputy Director General Spatial Planning and Land Use management - National Department of Rural Development and land Reform - Department of Rural Development and Land Reform - Mpumalanga Tourism and Parks Agency - South African Heritage Resources Agency - Mpumalanga Tourism and Parks Agency - Mpumalanga Department of Agriculture, Rural Development and Land Reform - Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs - Transnet Geo-Spatial (Inland) - Transnet Property
2.	Following a review of the SR and the application form, the following information is required: - An indication of all the similarly listed 2014 activities; - An indication if there are any new 2014 activities that are listed; - An indication where in the report all the 2014 activities have been assessed and mitigated for; - and, - A letter/affidavit from the EAP indicating that the above is true and correct. - This must form part of the EIAr as well as a separate document for ease of reference.	Please see Section 4 (Enviro-legal Requirements) for more details. Confirmation letter is attached on Appendix O.
3.	Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	According to the applicant, world standard technologies are being used on the facility; therefore no upgrading or decommissioning will be required in

	the near future. The facility is expected to operate for more than 30 years.
4. The total footprint of the proposed development should be indicated. Exact locations of the new Overvaal tunnel, and associated infrastructure should be mapped at an appropriate scale.	Please refer to Section 2 and Figure 1, for more details on the locations and description of the proposed project and associated locality map.
5. Should a Water Use License be required, proof of application for a license needs to be submitted.	It is understood that an integrated water use licence will be required. Please refer to Appendix L for proof of Water Use Licence Pre-Application Meeting Minutes.
6. Possible impacts and effects of the development on the vegetation ecology with regard to lowland- highland interface in the locality should be indicated.	Please see Section F (Impact Assessment) and Ecological Impact Assessment report (Appendix F) for more details.
7. The impacts of the proposed facility on avifauna and bats must be assessed in the EIA phase.	Please refer to Section 9 (impact assessment) and the Ecological Impact Assessment report (Appendix F) for more details.
8. Possible impacts and effects of the development on the surrounding industrial area.	Except for the AFRGRI storage facilities to the western tunnel exit, no other industries in close proximity of the proposed site, however impacts of the proposed tunnel on the existing structures and services have been assessed in the EIAR. Please refer to Section 9 (Impact Assessment) for more details.
9. The EIR should include information on the following: - Environmental costs vs benefits of the new Overvaal tunnel activity; and - Economic viability of the facility to the surrounding area and how the local community will benefit.	Please refer to Impact assessment section (section 9) for details on the assessment of impacts and suggested mitigation measures to reduce or enhance the magnitudes of both positive and negative impacts. Social impacts (e.g. Job creation) have been assessed as well in this EIAR please

	refer to Section 3 for anticipated job opportunities during construction.
10. Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained?	According to the applicant, it will be the responsibility of the Contractor to make his/ her own arrangements concerning the supply of electrical power and all other services. Please refer to Section 3 for more details on the services required during construction.
11. A construction and operational phase EMP to include mitigation and monitoring measures.	EMPr that fulfil the requirements of the EIA regulations is attached in this EIAR as Appendix M.
12. The applicant is hereby reminded to comply with the requirements of regulation 67 with regard to the time period allowed for complying with the requirements of the Regulations, and regulations 56 and 57 with regard to the allowance of a comment period for interested and affected parties on all reports submitted to the competent authority for decision-making. The reports referred to are listed in regulation 56(3a-3h).	Noted

3. LOCATIONS AND DESCRIPTION OF THE PROPOSED PROJECT

This section of the EIA serves to provide a description of the nature and extent of the proposed project.

3.1. Location

The proposed project is located approximately 30 km south east of Ermelo. The proposed project will be approximately 4 000 metres in length, commencing at 26°42’41.88”S and 30°9’41.31”E in the west and ending at 26°43’1.37”S and 30°11’54.67”E in the east. In the immediate vicinity of the site, there is a farmhouse with a guesthouse, AFGRI grain silos and rural residential dwellings. The proposed project area is accessed by a well-developed road network; the N2 national road between Ermelo and Piet Retief crosses the tunnel alignment, and gravel service roads lead from this tarred road to the respective portals.

TABLE 4: PROPOSED PROJECT LOCATION.

Attribute	Details
Province:	Mpumalanga

District Municipality:	Gert Sibande
Local Municipality	Msukaligwa
Closest Town:	Ermelo
Start Point (Western end)	26°42'41.88"S and 30°9'41.31"E
Approximate Centre Point:	26º 42' 51.38''S 30º 10' 46.71'' E
End Point (Eastern end)	26°43'1.37"S and 30°11'54.67"E
Farm names and portions to be affected by the proposed project	• Buhrmansvallei 297 IT (Portion 0, 2, 3, 4, 5, 8, 9, 13, 15); • Twyfelaar 298 IT (Portion 0 and 9); • Mavieriestad 321 IT (Portion 4); and • Klipfontein 326 IT (Portion 5).

The proposed project will be situated in an area that is characterised by a rolling to undulating topography. Localised well defined drainage channels located along the route, drain in a north easterly direction. The general surface elevation along the existing tunnel ranges from 1641 mamsl to 1656 mamsl (metres above mean sea level) in the west and central section increasing to approximately 1665 mamsl at the N2 and then decreasing rapidly to 1590 mamsl eastwards. The land uses surrounding the existing tunnel and proposed project includes primarily agricultural lands. The section along which the proposed project is located is currently used for grazing and cultivation. The regional area is also characterised by coal mining activities. The closest formal settlement to the proposed site is the Sheepmoor settlement, approximately 15 km east of the tunnel. The settlement is mainly residential, with surrounding agricultural activities and is without an economic base. A few residential houses exist within close proximity to the proposed project, towards the eastern tunnel exit. The majority of the landowners are small-scale livestock farmers who utilise the area for dry land crop cultivation. A single residential dwelling is located within the proposed project servitude. Further detail on the character of the receiving environment is provided in Section 4.

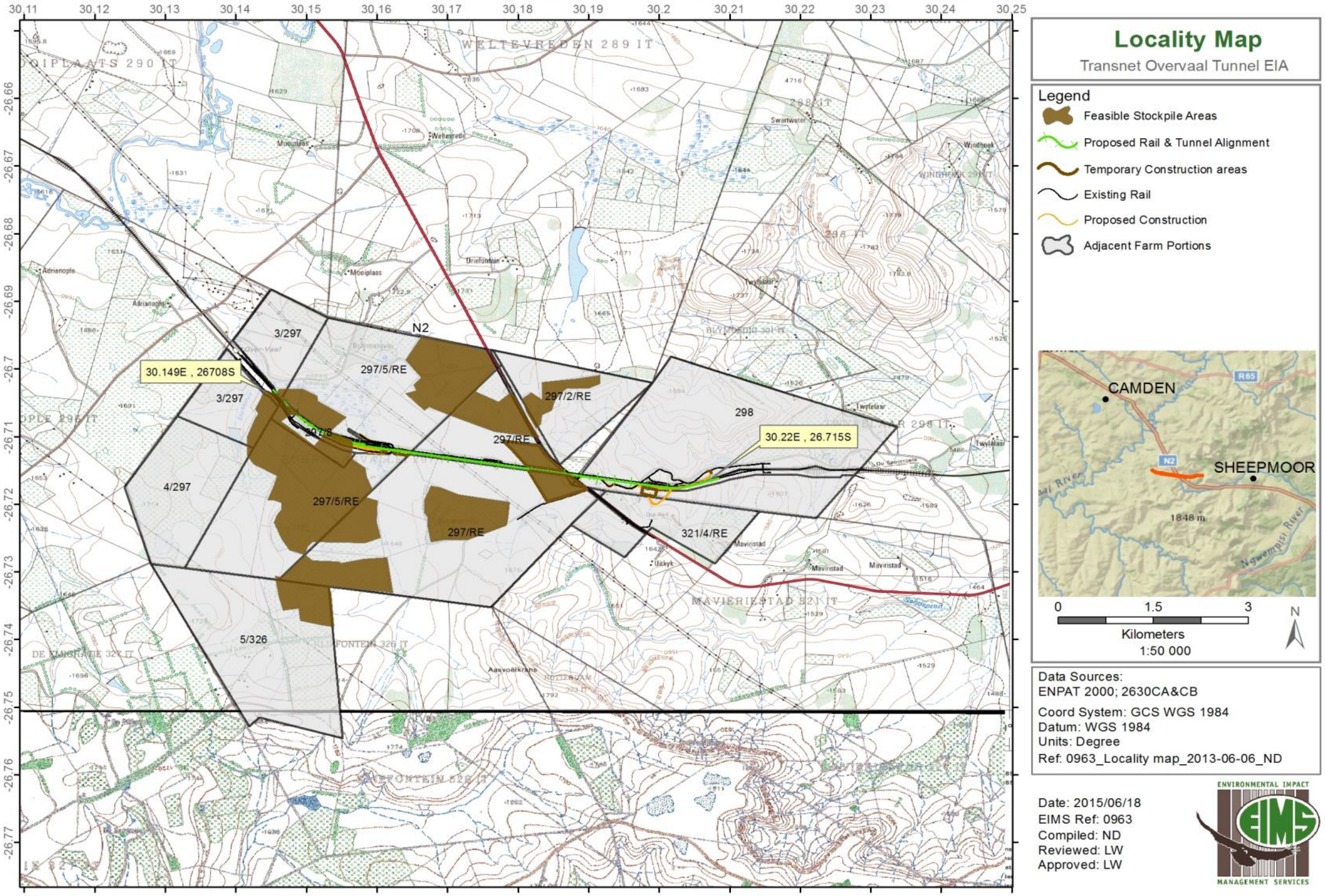

FIGURE 1: LOCALITY MAP SHOWING THE APPROXIMATE LOCATION OF THE PROPOSED PROJECT.

3.2. Proposed project

The proposed Overvaal Tunnel will be located in Mpumalanga, between the towns of Ermelo and Piet Retief, on the Richards Bay Coal Line. The proposed project requires the construction and operation of a new Transnet railway line within a new underground tunnel. The proposed construction of the second Overvaal Tunnel is part of an expansion programme to increase the capacity of the existing Richards Bay coal line to the Port of Richards Bay. The proposed project is required in order to improve turn–around times, thereby increasing freight handling to, and from, the Port of Richards Bay. The proposed project entails the following:

- Excavation, widening and construction of a second Overvaal tunnel (double track) parallel to the existing tunnel (at least 6.2 m diameter and approximately 4000 m long, including tunnel portal structures);
- Rehabilitation of one ventilation shaft above the existing Overvaal tunnel and the construction of ventilation shafts above the new Overvaal tunnel (to be implemented in phases);
- Cross passages between the two Overvaal tunnels;
- Walkways on both sides of the tunnel and barrier protected sanctuaries for material storage;
- Construction of a tunnel drainage system;
- Construction of drainage structures (berms, channels, culverts, and inlet- and outlet structures).
- Construction of a railway and perway,;
- Installation of cross-overs and switches at tunnel approaches;
- Establishment of rail signalling and a communication system;
- Installation of all overhead track equipment (OHTE) through the new tunnel, including tying into the existing double line;
- Tunnel lighting and distribution in accordance with the Occupational Health and Safety Act, 85 of 1993 (OHSA) and regulations;
- Construction of future service road access, including the widening of the approach cuttings; and
- Construction of yards and lay down areas (including the disposal of material stockpiles).

The majority of the work to be done will be undertaken while accommodating rail traffic on the existing railway line. The contractor will be responsible for arranging rail occupations, all safety measures (flagmen etc.) to allow for the safe passage of existing rail traffic.

The preliminary proposed project footprint design is presented in Appendix D. FIGURE 2 below provides a representation of what a typical double track tunnel will look like.

It is important to note that the management of water within the tunnel during operation is critical to manage the impacts on water resources. In this regard the design aim to prevent, as far as possible the ingress of stormwater into the tunnel at the western portal (refer to **Figure 6**). Secondly, water entering the tunnel from groundwater aquifers, or other sources, will need to be managed to prevent contamination by coal fines and other contaminants associated with the railway and discharging into the water resource sat the eastern tunnel portal. In this regard a system has been designed to separate clean and dirty water within the tunnel and to channel dirty water (with coal fines) to a coal fines trap (treatment system) at the eastern portal (refer to **Figure 5**).

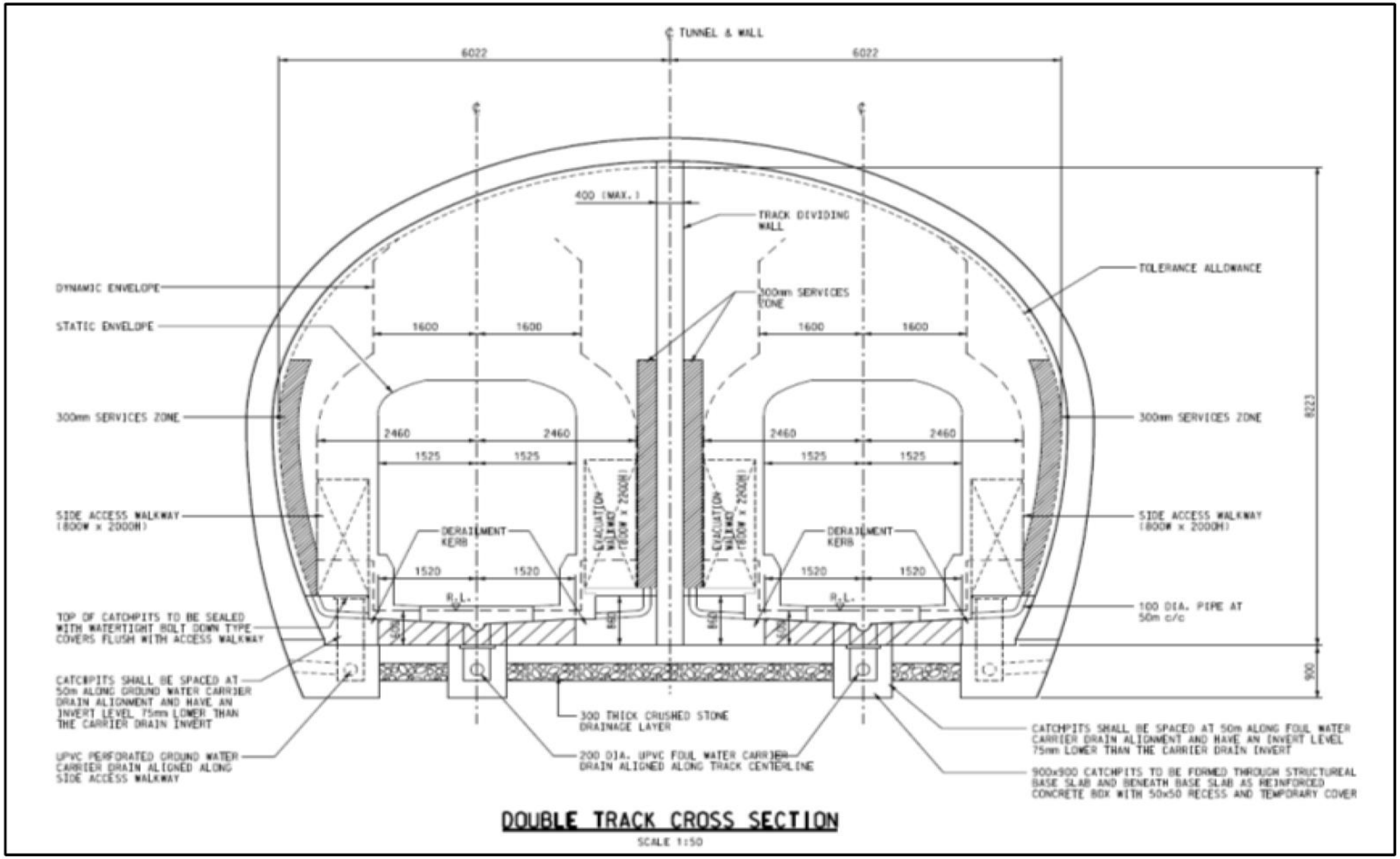

FIGURE 2: EXAMPLE OF A TWIN TRACK RAIL TUNNEL CROSS-SECTION (AURECON; 2014)

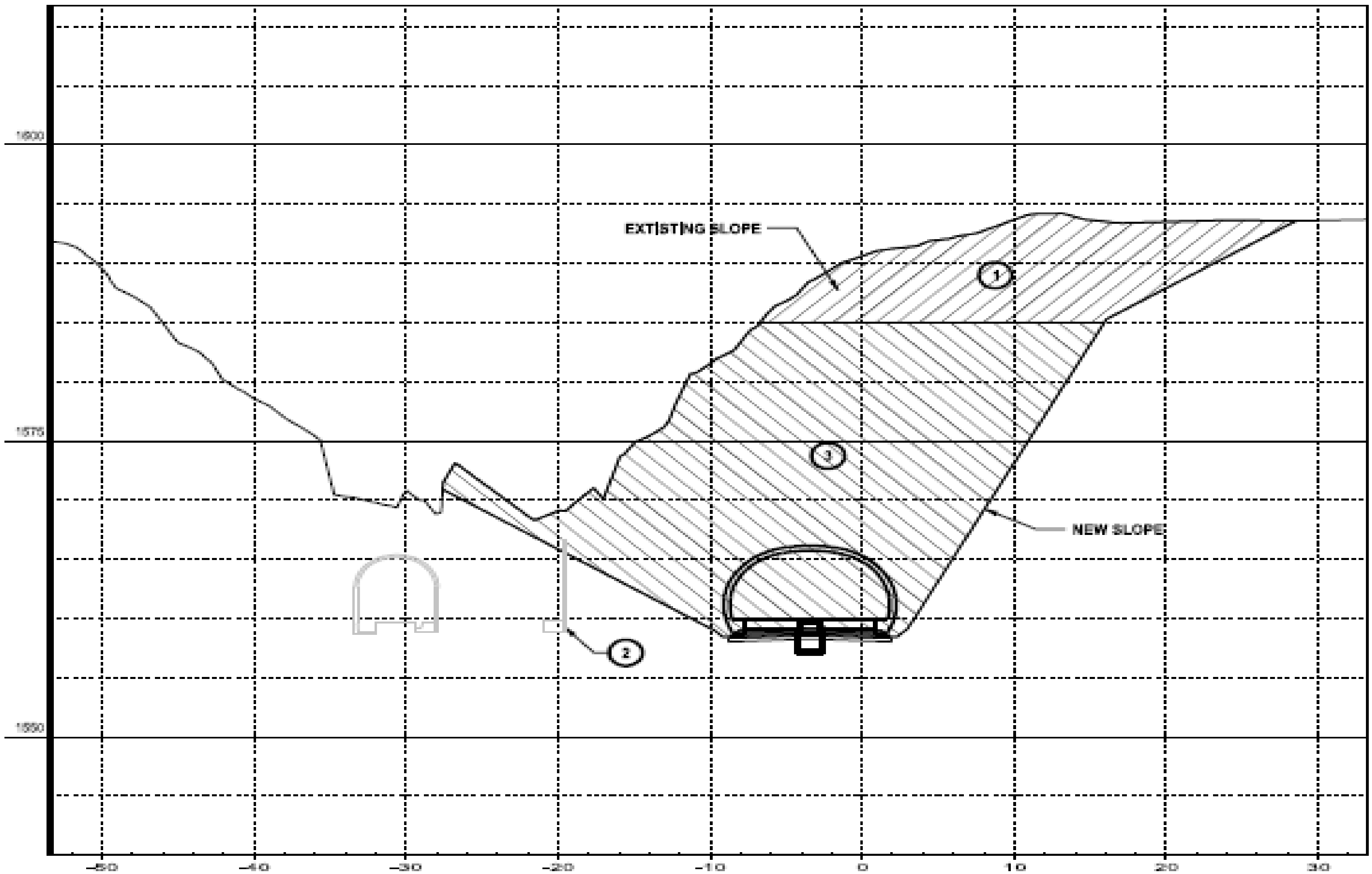

FIGURE 3: EXISTING AND NEW TUNNEL CROSS-SECTION AT EASTERN PORTAL (AURECON; 2014).

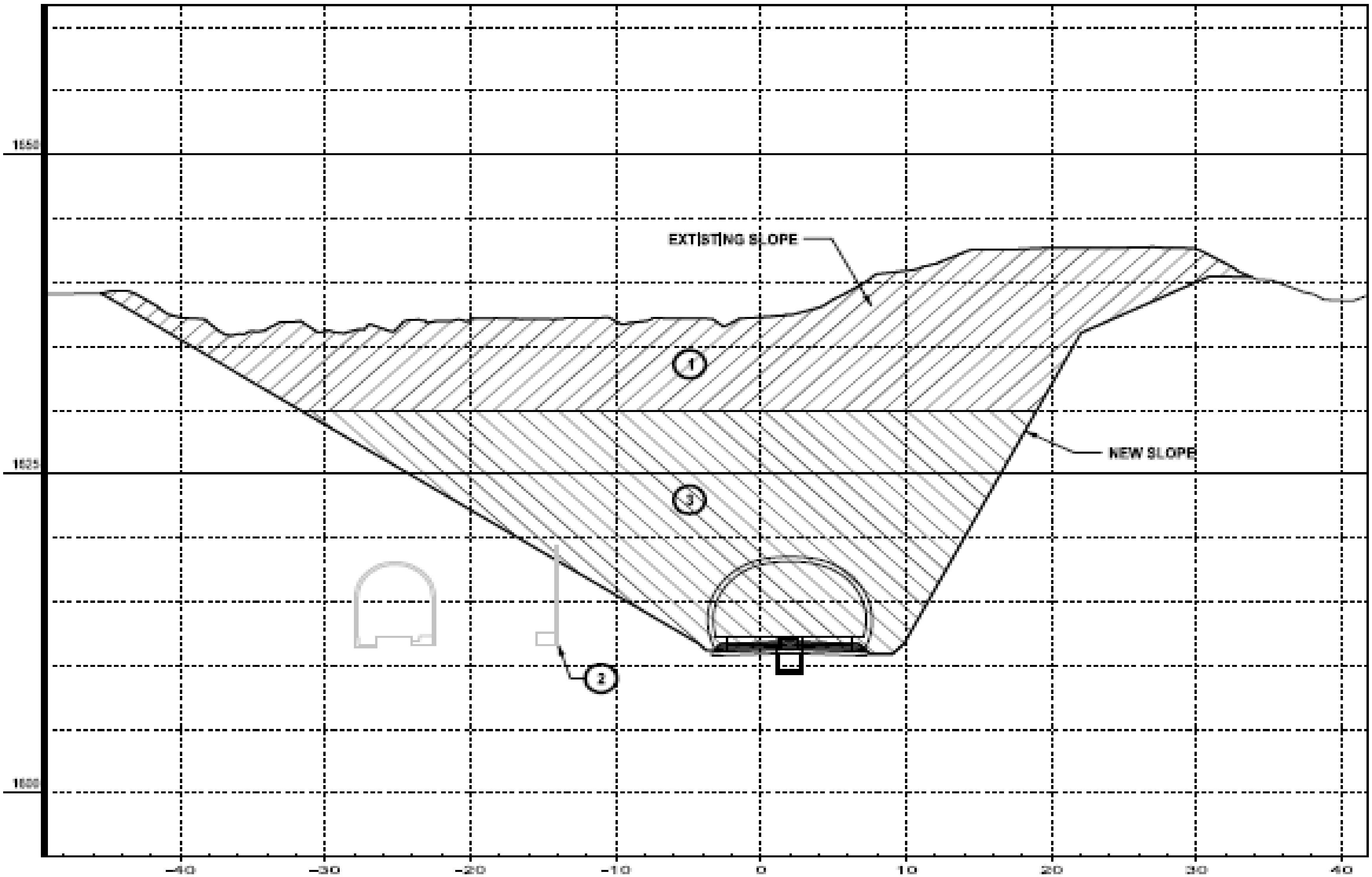

FIGURE 4: EXISTING AND NEW TUNNEL CROSS-SECTION AT WESTEWRN PORTAL (AURECON; 2014).

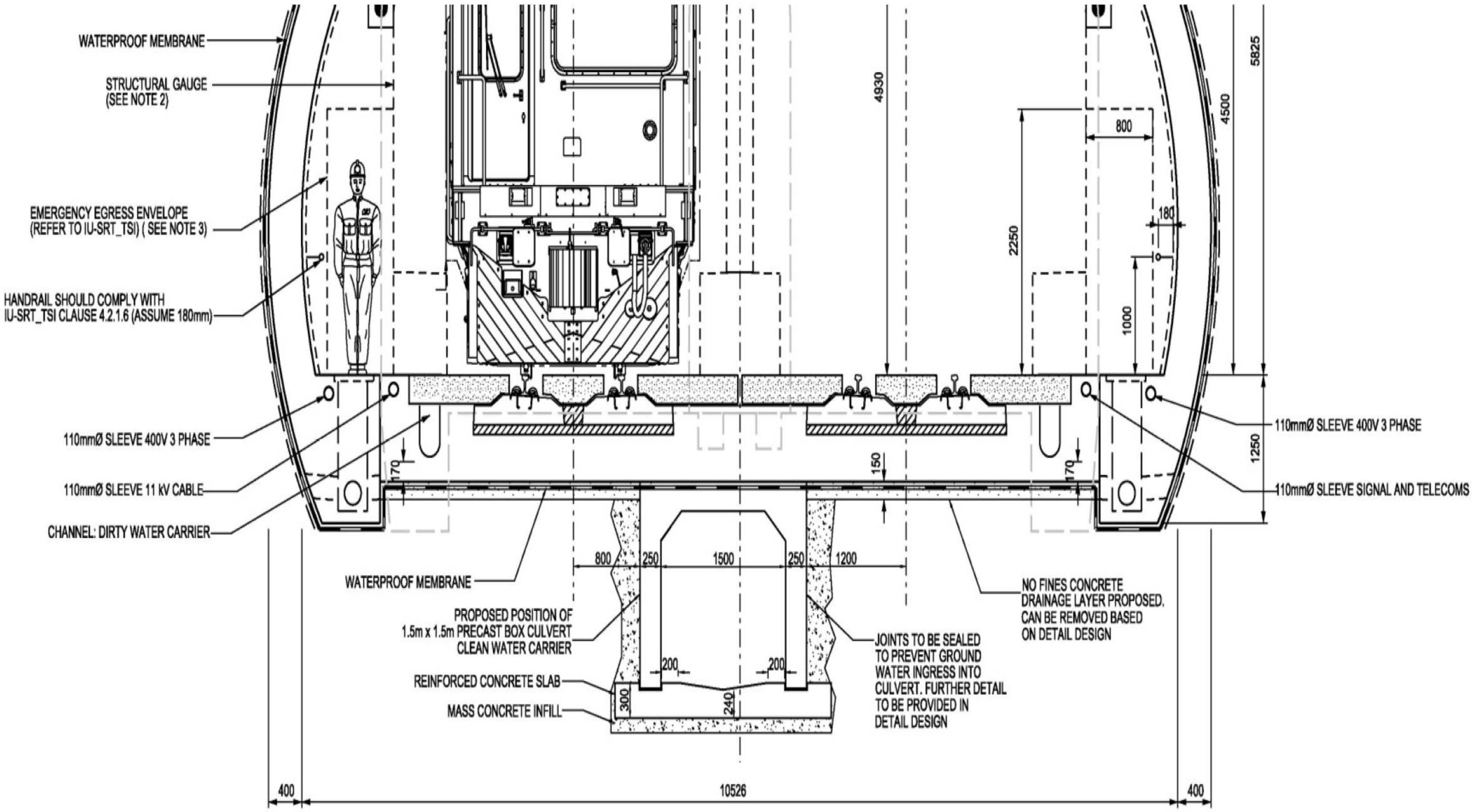

FIGURE 5: PROPOSED TUNNEL DESIGN TO SEPARATE CLEAN AND CONTAMINATED WATER (AURECON; 2014).

3.3. Construction phase activities

Construction phase activities will involve among other things the following: site acquisition, site clearance, excavation, material stockpiling and associated hauling, tunnelling (Drill and Blast/ Tunnel Boring Machine-TBM), drainage, foundations, rail, infrastructure, OHTE, signalling, and ventilation.

3.3.1. TUNNEL CONSTRUCTION

The construction process typically commences with site establishment. Site establishment deals with the provision of infrastructure (primarily temporary infrastructure) required for the purposes of construction and to allow the contractors to commence physical work. Services (including temporary services) need to be installed including water, sewage, and power, and levelling of land, construction of access roads; signalling and communication cables and establishment of construction offices. The terrain needs to be fenced off and security control and first aid facilities put in place. It will be the responsibility of the Contractor to make his/ her own arrangements concerning the supply of electrical power and all other services. At this stage capacity of services required has not yet been confirmed. Depending on the contractor appointed and the site specific details there may be a need for a concrete batching plant to be erected for the construction process. In the event that a concrete batching plant is required the relevant permits, approvals, and authorisations will be obtained by the relevant contractor.

A laydown area will be established at the proposed project site and will contain a site office, chemical toilets and lock-up facilities for valuables. Electricity will most probably be provided by mobile generators. Electricity will be used for lighting and industrial use such as welding and powering electrical equipment. Please refer to D for the proposed project footprint map which indicates the planned temporary and permanent construction areas.

A waste storage area will be established and will be used for temporal storage of waste material on site before removal by an appropriate licensed contractor. All wastes from various streams will be managed and disposed of in a manner to prevent potential impacts on the environment and risks to human health. The Contractor will be responsible for waste control within the construction site, removal of waste material produced from the site and to implement any mitigation measures to minimise waste or redress problems arising from the waste from the site. Activities during the construction phase will result in the generation of a variety of wastes which can broadly be classified into distinct categories based on their nature and the options for their disposal. These include:

- Excavated materials suitable for reclamation and fill;
- Construction and demolition waste some of which may be suitable for reclamation and fill. This category includes the vegetation cleared at the commencement of the works;
- Chemical waste;
- General refuse; and
- Sewage.

The site area, including the temporary haul and construction roads, will have to be cleared of the vegetation at the start of construction. This process will include trees, and the mixture of topsoil and vegetative matter. However, by stripping/uprooting the vegetation first, before removing the top soil, it would be possible to separate the earth into material for reuse on site, material suitable for public fill and the fraction that would require disposal. In this way, the amount of waste will be minimised.

It is unlikely that any large quantities of chemical wastes will be generated during the construction phase of this proposed project; however construction materials should be handled, stored, transported and disposed of in an appropriate manner. Other wastes including sewage and general refuse will be generated and these will also need to be collected and disposed offsite appropriately. Principles of waste minimisation at source, segregation for reuse, recycling and treatment or disposal will be applied to the handling of waste.

Raw materials will be sourced locally and/or abroad and include steel reinforcing, signalling equipment, sleepers, fasteners, cement, ballast stone, fireproofing and insulation, electrification equipment etc. During construction of the proposed project water will be abstracted from natural water resources. A Water use licence application process has been initiated with the Department of Water and Sanitation (DWS) (refer L to for a copy of the pre-application consultation minutes). In certain instances boreholes will be drilled with permission from the Department of Water and Sanitation (DWS). Location of the boreholes will be determined in consultation with DWS and the relevant landowners. It is estimated that the Drill and Blast construction method will require 40-80m^3/day. It is estimated that approximately 120m^3 will be required daily for a 900 day construction period for the purpose of concrete mixing, dust suppression on roads, tunnelling, etc. Water required for the construction activities will be available via the following options:

- Using the existing Transnet boreholes within the area if not dry;
- When groundwater is encountered, the contractor will be pumping the groundwater out, which will then be stored for construction use within JoJo tanks (water use included within the Water Use License process); and
- New boreholes will be drilled or use of adjacent farmers boreholes (water use included within the Water Use License process).

The contractor will pump out groundwater generated from the construction activities into temporary storage tanks which will be used for construction purposes. The quality of the water will need to be monitored by the contractor for any contamination. Contaminated water will need to be treated / handled appropriately.

For the construction phase, skilled and unskilled labourers will be required. Skilled labour will be sourced nationally, including Mpumalanga Province. However semi-skilled and unskilled labour will be sourced locally as far as practicable. Skilled labourers will be required to operate machinery and equipment on site. Skilled artisans and supervisors will also be required. Unskilled workers will be used for manual labour tasks on site. According to the applicant R3, 867 billion is allocated for construction of the proposed project. The proposed project will generate 2 360 work opportunities, of which just over 846 will be for unskilled workers; thereby significantly contributing to the Government's job creation targets. Of 2 360, 533 employees will be skilled, while 980 will be semi-skilled. Apart from direct employment, local people and businesses could benefit through the supply of goods and services to the appointed contractors. The construction area will need to make provision for the construction staff and will include a temporary construction camp. It will be the responsibility of the Contractor to make his/ her own arrangements concerning the supply of various services to the camp. The construction camp would typically include:

- Access facilities;
- Ablution facilities;
- Areas for the storage of hazardous substances required for construction (e.g. oils and lubricants that will be stored and dispensed at the construction camp);
- Material lay-down areas;
- Accommodation facilities (if required);
- Waste storage and transition areas (various waste streams);
- Offices;
- Parking areas;
- Fuel storage;
- Water storage facilities;
- Stormwater management facilities; and
- Workshop areas.

Construction of the tunnel is unlikely to put a significant impact on local services and infrastructure, however it is at this stage anticipated that, at least one homestead that is located along the proposed route will be affected by the proposed development. It is therefore recommended that, any damage to public or private property, be repaired, replaced or otherwise compensated for as agreed to with the affected party. The proposed project sites traverse the N2, a major transport route. Construction may result in a temporary disruption to traffic flow. Slow moving, heavy load trucks and smaller construction vehicles entering and exiting the N2 may require traffic calming measures to be introduced for safety purposes. This is likely to have an impact on daily road users during the course of the construction works.

Light pollution is anticipated at night due to the fact that there is a possibility that construction can be undertaken on a 24hr basis. In terms of scheduling it is anticipated that the construction phase will be over a period of approximately 24 months.

With reference to **FIGURE 2** and **Figure 8**, the Overvaal tunnel engineering components will include the following:

- A double tunnel structure (Accommodates two tracks) – a completely sealed/waterproof inverted arch tunnel approximately 4 km in length, including portal structures;

- Construction of a physical barrier between the two tracks;
- Walkways on both sides of the tunnel and barrier protected sanctuaries for material storage;
- Ventilation solutions to be designed and provided for both the existing tunnel and the new tunnel;
- Use by diesel- electric locomotives– high temperature mitigation, and air quality control;
- Mechanical fit outs;
- Extension of the existing cross passages (to provide linkage between the two tunnels);
- Fire proof doors at the cross tunnels;
- Tunnel drainage system;
- Insulation of the new tunnel;
- Railway and Perway, including extension of platforms at approaches;
- Transition technology;
- Cross-over and switch-yards at tunnel approaches;
- Rail signalling system and communication (signal relay equipment outside tunnel);
- Permanent warning system for the new and existing tunnel (must have an automated pantograph warning system on the outside of the tunnel);
- Power supply for operations;
- All OHTE through the new tunnel including tying into the existing double line including switching arrangements and tunnel profiles;
- Tunnel lighting and distribution in accordance with the OSH Act and regulations;
- Sufficient cable ducts to allow for any future works;
- Sufficient plug points for emergency and maintenance; and
- Communications infrastructure.

3.3.2. ACCESS ROADS

Whilst every reasonable effort will be made by Transnet to maximize the use of existing roads, the construction process and the operation of the facilities will require access by construction and maintenance vehicles respectively. Access to the site is generally relatively easy through a well-established access road that connects to the (National Route) N2 highway that travels from Ermelo to Piet Retief towns. Access to the existing tunnel is only via railway maintenance road. The construction of access roads for the purposes of construction (e.g. delivery of the construction material and equipment, etc.) may be required however this will be temporary.

The main activities involved in the construction of a typical road include:

- Route surveying and pegging;
- Land procurement and land and rights processes (for permanent roads- temporary roads will require landowner consent);
- Identification and licensing of suitable sources of road building materials (e.g. borrow pits);

- Bulk earthworks, grading and contouring;
- Import of materials for layering; and
- Surfacing (e.g. asphalt, gravel).

For the purpose of construction, it is anticipated that construction of temporary access roads will be undertaken by the relevant contractor appointed by Transnet.

3.3.3. DRAINAGE

Of specific importance is the fact that the tunnel cross section needs to accommodate storm water from the Western entrance of the tunnel and discharge it through the Eastern exit. The western (upstream) approach to the tunnels features a deep rock cutting, nearly 1.8 km in length. The first fundamental principle would be to prevent storm water from the surrounding areas from entering the cutting and to rather divert it around the tunnel entrance towards the natural water courses. An existing channel currently serves to divert storm water around the tunnel entrance. With the majority of the storm water diverted, the remaining storm water will be manageable inside the cutting and through the new tunnel.

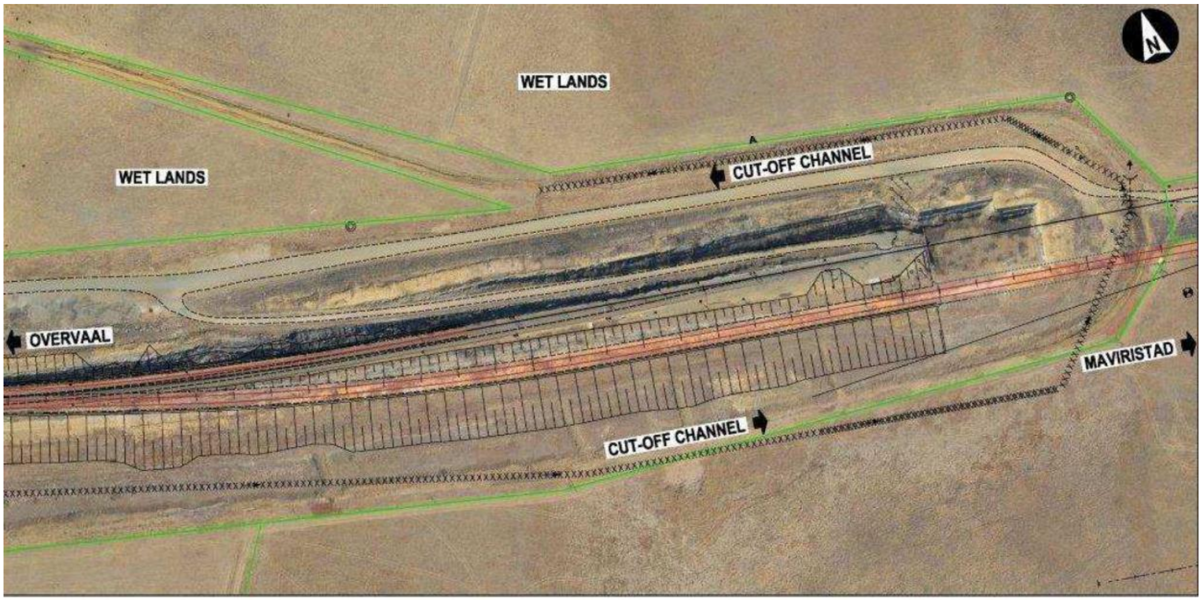

FIGURE 6: PROPOSED CUT-OFF CHANNEL AT WESTERN PORTAL

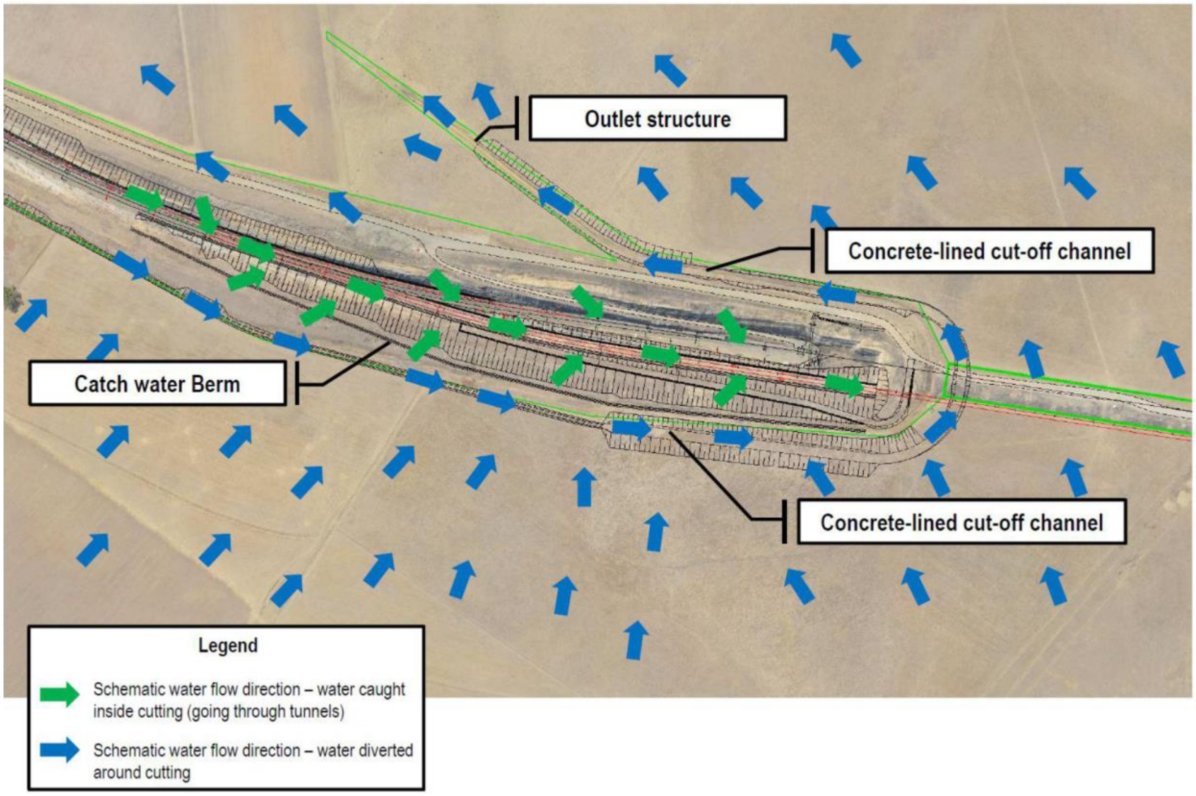

FIGURE 7: SCHEMATIC DIAGRAM INDICATING DRAINAGE PHILOSOPHY AT TUNNEL ACCESS CUTTING (OVERVAAL-SIDE).

The eastern (downstream) exit of the tunnel features a shorter, shallower rock cutting. Again storm water from the surrounding areas would be prevented from entering the cutting so that storm water inside the cutting will be manageable when added to the storm water exiting the tunnel. Flood calculations were done based on the 1:70 (1.43%) grade of the existing tunnel and a 1:100 year flood recurrence. Side drains inside the tunnel will be concrete u-drains, in order to optimize spatial constraints.

According to the Engineers planned coal fines traps will be 2.5 m wide and the depth will vary between 0.5m-1.4m. The volumes of water expected within this traps is 65m³ for cleaning the tunnel (this is recommenced to commence only once a year at max), water dripping from the train during rain is almost negligible at 0.5m³. The traps will be located just outside the tunnel on the Maviristad side. No water will be discharged from the traps as it is closed off in order for natural evaporation to occur (refer to Appendix N).

Although this system is not expected to require regular maintenance, initial regular inspections are recommended in order to understand the required cleaning that will be necessitated from the accumulated coal dust. Maintenance involves removing of concrete grids, removing coal dust and reinstating concrete grids. Cleaning of the coal fines trap can be done with normal shovels. Maintenance of the contaminated drainage system can be done by small team of labourers.

3.3.4. WASTE ROCK STOCKPILE

In respect of excavated material, a total of approximately 1 000 000m^3 of material will be generated through excavation of the tunnel and entrance / exit cuttings (please refer to Figure 3 and Figure 4). According to the material investigation undertaken by the Engineers, It is anticipated that only a negligible amount of material will be suitable for reuse on this proposed project. Based on the nature of the proposed project, only rock materials that meet the SANS 1083 standards will be used during construction for the purpose of concrete mixing. However this material could possibly be reused on other projects in the future. Large amount of rock material will be stockpiled and rehabilitated for use in future when the need arise. Portions of waste material will be used to fill up two existing borrow pits situated approximately 3500m to the east of the proposed project site. Material may have to be transported off-site to a public fill facility or to another site for reuse, however the aim of the applicant is to make sure that where possible materials are not transported offsite. It is important to note that due to the fact that opportunities for reuse of the excavated material by third parties are not presently defined, this EIA will assess the impacts, on the assumption that the material is stored/ disposed of permanently. Any future users of the material will need to comply with applicable legislation pertaining to the reuse of the material prior to use.

The location of stockpile areas is the subject of a comprehensive alternative analysis presented in Section 10 if this EIAR. Management and mitigation measures associated with the responsible operation of the stockpile are also addressed in the EMPr.

3.4. Operational phase activities

The operational phase refers to the actual operation of the proposed project and associated structures; (e.g. in this case, the railway lines). The operation of the tunnel is unlikely to put a significant burden on local services and infrastructure. The facility is typically unmanned and would not require service provision except for maintenance of rail infrastructure, OHTE, which will not be required on a frequent basis.

The following type of personnel will be recruited for the operational phase of the proposed project, as the capacity of the line is increased over time: mechanical fitter / electricians; electrical, perway, telecoms; engineering technicians (signalling), engineering technician in training (signalling), technical workers (signalling), train assistants, train control officers, service drivers, train drivers and general workers. In addition and indirectly, both temporary and permanent jobs will be created in the manufacture of wagons and equipment for the railway line.

The proposed project and associated railway line will typically only require a single access road for the purposes of maintenance during operation phase. Table 1 below provide the summary maintenance requirements of the proposed Overvaal Tunnel.

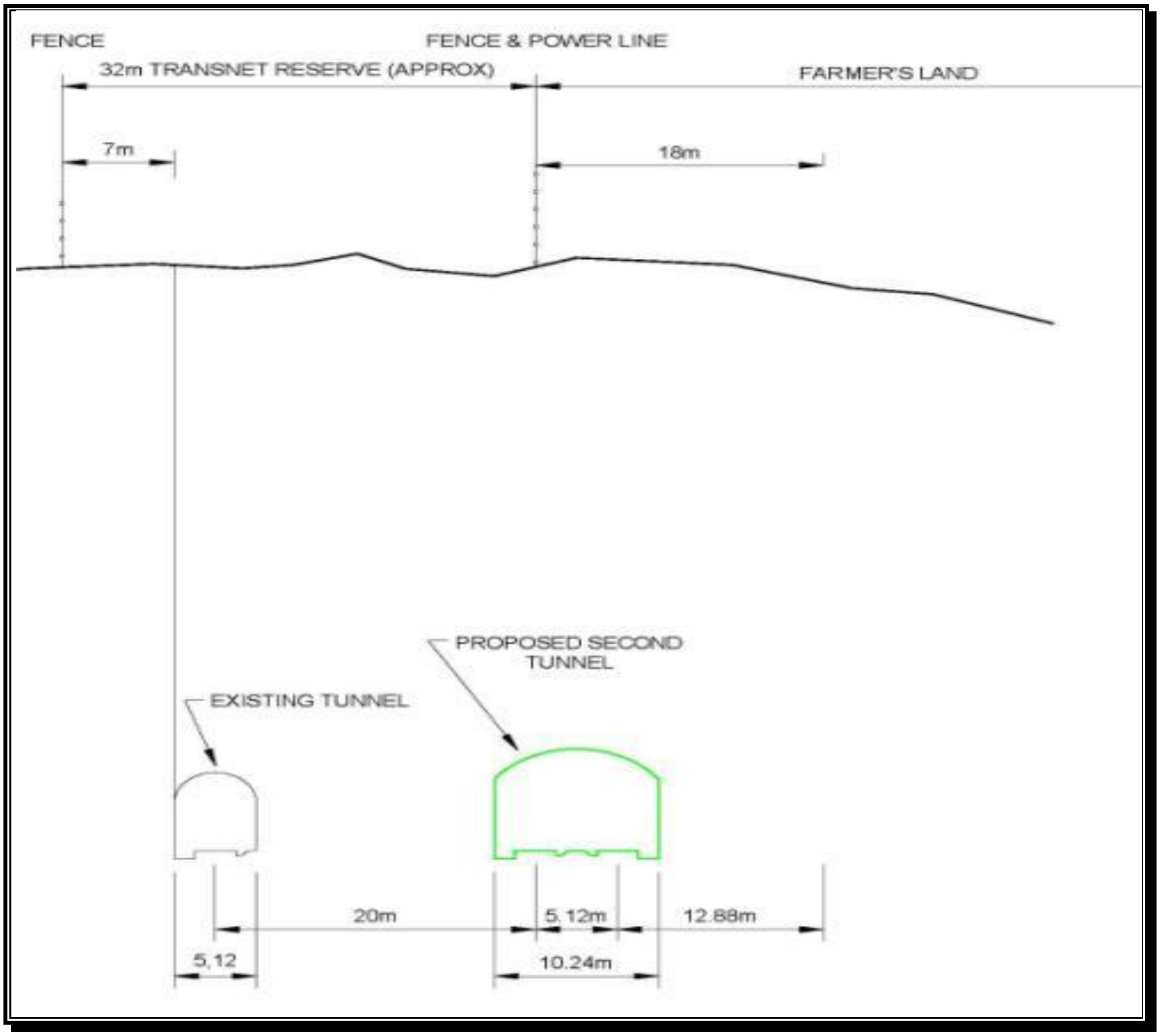

FIGURE 8: VIEW OF THE EXISTING SINGLE TRACK AND PROPOSED DOUBLE TRACK TUNNELS

TABLE 5: OVERVAAL TUNNEL MAINTENEANCE REQUIREMENTS

Requirements	Description
1. Protection during maintenance	One of the ORS requirements is a temporary physical barrier inside the tunnel between the two tracks to protect workers working on one line while trains are moving on the adjacent line. The intention with these temporary barriers is to provide a barricaded area which is outside the clearance envelope of the opposite line, rather than providing an impact barrier. Various off-the-shelf products are available for this purpose and should be procured and used during tunnel maintenance. Paint markings can be provided on the tunnel floor indicating safe position for erecting the barriers.
2. Ventilation System	A general maintenance plan should be carried out for the tunnel ventilation equipment, which includes the mechanical and electrical components of the system. Maintenance must be carried out on the fan assembly, motors, motor controls/VSDs and ventilation monitoring systems by appropriately qualified

	personnel using the correct tools and equipment. A regular maintenance schedule should be established and a record kept. There may be necessary reduction in the intervals depending on the environment and operating conditions. A more detailed maintenance schedule and an operations and maintenance manual should be provided by the equipment manufacturers in the implementation phase.
3. Electrical equipment	
3.1. Generators	The generators are the most maintenance intensive components of the entire electrical installation. Several options are available for conducting preventative maintenance on the generator sets to be installed. It is preferable to outsource the maintenance of the generators to specialists (generally the suppliers), in which case no additional personnel or training is required. Generator maintenance can be carried out by one person qualified as a generator technician.
3.2. Transformers	In normal operating conditions, an annual inspection is required. This inspection involves checking the tightness of the bolts on terminals and tapping links, vacuum cleaning of the transformer and blowing off inaccessible areas with dry compressed air or nitrogen. The frequency of cleaning will however depend on environmental conditions. The transformer inspection can be carried out by a person with suitable knowledge of High Voltage equipment and switching as the transformers will have to be switched off before the maintenance can be conducted.
3.3. Lighting	The tunnel lighting design makes use of technology which requires no lamp or component replacements for 10 years. Occasional cleaning of coal dust build up may be required. Cleaning of the light fittings can be done by a general worker.
3.4. RMU's (Ring Main Unit)	The enclosure is filled with SF6 at a 0.2 bar gauge pressure. It is sealed for life after filling. Its tightness, which is systematically checked at the factory, gives the switchgear an expected lifetime of 30 years. No maintenance of live parts is necessary.
4. Drainage System	
4.1. Cut-off channel	The cut-off drain is located on the western approach to the tunnel. The channel is designed to prevent storm water from the surrounding areas from entering the cutting and to divert it around the tunnel entrance towards the pond area north west of the site. The maintenance of this channel is critical in order to prevent storm water from flooding the tunnel. Maintenance required involves regular cleaning and removing of silt or sand from the channel and checking for scouring at the outlet of the channel, and can be done by small team of labourers.
4.2. Side-drains / channels inside cuttings	The maintenance of these channels is critical in order to prevent storm water damaging the rail formation layers. Maintenance required involves regular cleaning and removing of silt or sand from the channel, and can be done by a small team of labourers.
4.3. Stormwater drain inside tunnel	The stormwater system is designed with a gradient which is sufficient for self-cleaning of the system. However, manholes have been included in the design to access the system. Inspections should be done annually and if necessary, debris, sand or silt build-up needs to be removed.
4.4. Contaminated drainage system	Although this system is not expected to require regular maintenance, initial regular inspections are recommended in order to understand the required cleaning that will be necessitated from the accumulated coal dust. Maintenance involves removing of concrete grids, removing coal dust and reinstating concrete grids. Cleaning of the coal fines trap can be done with normal shovels. Maintenance of the contaminated drainage system can be done by small team of labourers.

4.5. Subsoil Drainage System	Initial regular inspections are also recommended for the subsoil drainage system in order to understand groundwater seepage locations and specific areas where seepage and fines/sludge may be a problem. The required flushing of strip drains can be ascertained from the recorded observations. Generally this will be minimum 6 months, most often longer.
4.6. Track-system	Different track systems were evaluated for implementation inside the tunnel. The maintainability of the system was included in the evaluation criteria, in order to ensure that it complies with Transnet's normal track maintenance regimes. This includes for the rails to be accessible for welding, clamping and testing, allowance for adjustments and cleaning of fasteners. Driveability blocks however need to be removed by small crane before any maintenance on the rail or fastenings can be done. No additional maintenance personnel will be required.

3.5. Decomissioning phase

In accordance with the requirements of the EIA regulations it is important to consider and assess the likely impacts resulting from the decommissioning of the facility and infrastructure. It is important to note that whilst the design life of the tunnel is ~100 years, at present there is no intention to decommission the proposed project and associated railway lines at any time in the near future. The design life of the tunnel at present is ~100 year and where necessary, applicable maintenance and repairs of the rail infrastructure will be carried out to ensure continuous operation.

In the unlikely event that the facility needs to be decommissioned, a proper procedure in accordance with prepared and agreed decommissioning plan should be followed. Decommissioning typically involves the following activities:

- Disconnection and removal of equipment;
- Dismantling and demolition of structures;
- Re-use, recycle, reduce, and/or dispose of relevant materials;
- Re-instatement of disturbed areas; and
- Rehabilitation and monitoring.

The ultimate objective of the decommissioning would be to re-instate the affected areas to a state in similar or better condition to the current environment.

4. ENVIRO-LEGAL REQUIREMENTS

This section provides an overview of the governing legislation identified which may relate to the proposed project. The primary legal requirement for this project stems from the need for an EA to be granted by the DEA in accordance with the requirements of the NEMA. In addition, there are numerous other pieces of legislation which should be considered by Transnet in order to assess the potential applicability of these for the proposed activity. Legislation that is potentially applicable to the project includes:

- National Environmental Management Act (Act 107 of 1998);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);

- Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA);
- National Water Act (Act No. 36 of 1998);
- National Environmental Management: Waste Act (Act No. 59 of 2008);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004);
- Environment Conservation Act (Act No. 73 of 1989);
- National Forests Act (Act No. 84 of 1998);
- National Heritage Resources Act (Act No. 25 of 1999);
- The South African National Roads Agency Limited and National Roads Act (Act No. 7 of 1998);
- The Constitution (Act No. 108 of 1996); and
- Mpumalanga Roads Act (Act No. 1 of 2008).

4.1. National Environmental Management Act (Act No. 107 of 1998)

The National Environmental Management Act (Act No. 107 of 1998) as amended (NEMA), aims to protect the environment, and stipulates that developments must be socially, environmentally and economically sustainable, and that disturbances and pollution of the environment must be avoided, minimised and remedied. The Act also provides for the equitable access to environmental resources, to meet basic human needs. Decisions on the environment must be taken in an open and transparent manner, and resources must be held in trust for the public and protected as such. NEMA also makes provision for the cost of remedying pollution, and all such costs shall be paid by the polluter.

Section 24 (2) in NEMA (1998) provides for activities which may have a detrimental effect on the environment and may not commence without environmental authorisation (EA) from the competent authority. In Section 24 (4 & 5) provision is made for the Regulations which stipulate the minimum procedures for the issuing of and monitoring compliance with EA's. Section 24 (8), states that authorisations or permits obtained under any other law for an activity listed or specified in terms of this Act does not absolve the applicant from obtaining authorisation under this Act.

In accordance with Section 24 of the NEMA, the Minister has published (in GN R. 544, 545, and 546) a list of activities that require EA prior to commencement of these activities. In this regard Table 6 provides a list of the specific activities extracted from the Regulations which the proposed project may potentially trigger, and which consequently have been applied for in this application for EA. It is important to note that subsequent to the submission of an application for EA (integrated application) the Minister has promulgated and brought into effect (as from December 2014) new EIA regulations and consequently repealed the old regulations under which this application was made. However, in accordance with the transitional arrangements provided in the new regulations, any application submitted in terms of the previous NEMA regulations, including pending applications, must despite the repeal of those regulations be dispensed with in terms of those regulations. As a result of these transitional arrangement and as requested by the DEA in the approval of the Scoping Report, Table 6 provides a list of the activities which may be triggered under the new regulations. The aim of this is to ensure that all listed activities identified under the new regulations are adequately identified and addressed in this EIA process.

It is further important to note that in accordance with Section 24L of the NEMA that, the DEA, in respect of a listed activity or specified activity, may regard such EA as a sufficient basis for the granting or refusing of an authorisation, a permit or a licence under a specific environmental management Act if that specific environmental management Act is also administered by that competent authority. IN this regard EIMS has submitted an Integrated Environmental Application to the DEA, with the intention of obtaining an integrated environmental authorisation to accommodate the listed activities under both the NEMA EIA regulations and the NEMWA listed activities. Please refer to Section 3.6 for further detail on the NEMWA listed activities.

TABLE 6: ANTICIPATED NEMA LISTED ACTIVITIES

NEMA Listed Activity				
NEMA listed activities - Government Notice R544 – Listing Notice 1 (Old Regulations)		NEMA listed activities – Government Notice R983 – Listing Notice 1 (New Regulations)		Reason for inclusion
2[2]	The construction of facilities or infrastructure for the storage of ore or coal that requires an atmospheric emissions license in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004). The threshold in the NEMAQA is 100 000 tons			As the project will not be storing coal and the spoil excavated from the tunnel does not fulfil the definition of "ore" this activity will not be pursued further. Based on the available geological information it is anticipated that some carboniferous material may be excavated (primarily at the western portal). It is anticipated that this material will not be of significant volume and will be managed responsibly according to the EMPr.
9 (i); (ii)	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water - (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a) such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or	**9 (i); (ii)**	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or stormwater – (i) with an internal diameter of 0,36 metres or more; or (ii) with peak throughput of 120 litres per second or more. The development and related operation of infrastructure exceeding 1000 metres in length for	Facilities for bulk transportation of storm water may be required as part of the construction or operational activities for this project. The storm water system in the tunnel will be ~0.75m x 0.75m which exceeds the criteria for triggering this activity. There are numerous wetlands and a streams in the vicinity of the proposed project. In addition a cut-off drain system will be developed at the western portal to prevent surface water/ stormwater ingress

[2] ITEMS IN BLUE TEXT ARE NO LONGER APPLICABLE TO THIS APPLICATION

NEMA Listed Activity				
	b) where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	**10(i); (ii)**	the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 metres or more; or (ii) with peak throughput of 120 litres per second or more.	into the tunnel. This structure is likely to exceed 1000m. The water collected and transported from the tunnel will be separated into clean and contaminated water and managed accordingly.
11(ii); (vi); (xi)	The construction of: (iii) channels; (iv) (vi) bulk storm water outlet structures; (xi) Infrastructure or structures covering 50 square metres or more – where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	**12 (ii); (vi); (xii)**	The construction of – ii) channels exceeding 100 square metres; (vi) bulk stormwater outlet structures exceeding 100 square metres; (xii) infrastructure or structures with a physical footprint of 100 square metres or more. Where such development occurs – 32 m a) within a watercourse; c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of ac watercourse.	There are numerous wetlands and a streams in the vicinity of the proposed project. The new tunnel and associated infrastructure (e.g. rail system, associated structures, channels and storm water systems) will exceed 50 m^2 and will trigger this activity based on its proximity to watercourses in the area.
13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.	**14**	The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	As the project will not be storing dangerous goods this activity will not be pursued further.

NEMA Listed Activity				
18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 cubic metres from: (i) a watercourse – but excluding where such infilling, depositing , dredging, excavation, removal or moving; (a) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or (b) occurs behind the development setback line. [Corrected by "Correction Notice 2" of 10 December 2010, GN No. R. 1159].	**19 (i)**	The infilling or depositing of any material more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from – (i) a watercourse.	The construction process will require removal of rock and soil in the vicinity of a watercourse (i.e. wetland and stream in the vicinity of the proposed new tunnel site).
24	The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule or thereafter such land was zoned open space, conservation or had an equivalent zoning.			It is anticipated that land larger than 1000 m^2 will be transformed for the construction of the proposed new tunnel. A portion of the construction will be within a rail reserve. However, to accommodate the new tunnel, some of the agricultural land to the south of the existing rail reserve will be transformed. Approximately 50 hectares of land will be transformed as lay down areas and spoil areas.
28	The expansion of or changes to existing facilities for any process or activity where such expansion or changes to will result in the need for a [new, or amendment of, an			The existing tunnel has a drainage facility. This facility will need to be upgraded and expanded to accommodate the new tunnel.

NEMA Listed Activity				
	existing] permit or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.			The proposed facility includes a function to separate clean and contaminated water. The hydrogeological reports estimate that there will be an inflow of water into the tunnel of ~124m3/day. Waste water produced as a result of various construction activities such as for example batching could be released into the natural water system. It is anticipated that a Water Use Licence will be required for the release of the waste water.
37	The expansion of facilities or infrastructure for the bulk transportation of water, sewage or stormwater where: (a) the facility or infrastructure is expanded by more than 1000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more.	**45 (i); (ii)**	The expansion of infrastructure for the bulk transportation of water or stormwater where the existing infrastructure – (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and a) where the facility or infrastructure is expanded by more than 1000 metres in length; or b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more.	The existing storm water facilities in place for the existing tunnel may need to be expanded and upgraded to accommodate the new tunnel. The expansion to the storm water channel at the Overvaal entrance to the tunnel; will increase the throughput capacity by more than 10%.
37	The expansion of facilities or infrastructure for the bulk transportation of water, sewage or stormwater where:	**46**	The expansion or related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial	There are numerous wetlands and streams in the vicinity of study area resulting in considerable amounts of ground water

NEMA Listed Activity				
	(a) the facility or infrastructure is expanded by more than 1000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more. excluding where such expansion: (i) relates to transportation of water, sewage or storm water within a road reserve; or (ii) where such expansion will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.		discharge or slimes where the existing infrastructure – (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and a) where the facility or infrastructure is expanded by more than 1000 metres in length; or b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more.	drainage where the existing tunnel is located. The new tunnel will be approximately 20 m from the existing tunnel and thus existing infrastructure to manage the observed drainage may require expansion (e.g. canals, channels and storm water systems) to accommodate the new tunnel. Such expansion is likely to affect the surrounding wetlands and/or stream. The proposed storm water reservoir at the Maviristad entrance of the tunnel and the associated channels as well as the expansion of the channel at the Overvaal entrance will take place within 32 m of a watercourse.
39 (i); (ii); (v)	The expansion of (i) canals, (ii) channels,(v) bulk stormwater outlet structures; within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will occur behind the development setback line.	48	The expansion of (i) canals where the canal is expanded by 100m2 or more; (ii) channels where the canal is expanded by 100m2 or more, (iii) bulk stormwater outlet structures where the bulk stormwater outlet structure is expanded by 100m2 or more . Where such expansion occurs (a) within a watercourse or (c) within 32 metres of a watercourse, measured from the edge of a watercourse.	
40 (iv)	The expansion of: (iv) infrastructure by more than 50 square metres…within a watercourse or within 32 metres of a	**49 (v)**	The expansion of – (v) infrastructure or structures where the physical footprint is expanded by 100 square metres or more.	There are numerous wetlands and a stream in the vicinity of proposed project. The construction of the new tunnel is likely to require expansion of existing infrastructure

NEMA Listed Activity				
	watercourse, measured from the edge of a watercourse, but excluding where such expansion will occur behind the development setback line.		Where such expansion or expansion and related operation occurs – a) within a watercourse.	(e.g. channels, storm water systems) exceeding 50 m^2, which may affect the surrounding wetlands and/or stream. The infrastructure to accommodate the addition railway line and the tunnel approaches at the Maviristad entrance as well as the expansion of the storm water channel at the Overvaal side (western portal) will take place either within a watercourse or within 32m of the edge of a watercourse.
		48 (ii); (vi)	The expansion of: (ii) channels where the channel is expanded by 100 metres or more in size; (vi) bulk stormwater outlet structures where the bulk stormwater outlet structure is expanded by 100 metres or more in size. Where such expansion or expansion and related operation occurs – a) within a watercourse.	There are numerous wetlands and a stream in the vicinity of proposed project. The construction of the new tunnel is likely to require expansion of existing infrastructure (e.g. channels, storm water systems), which may affect the surrounding wetlands and/or stream. The infrastructure to accommodate the addition railway line and the tunnel approaches at the Maviristad entrance (eastern portal) as well as the expansion of the storm water channel at the Overvaal side (western portal) will take place either within a watercourse or within 32 m of the edge of a watercourse.

NEMA Listed Activity				
49 (iii)	The expansion of facilities or infrastructure for the bulk transportation of dangerous goods: (iii) in solid form, outside an industrial complex or zone, by an increased throughput capacity of 50 tons or more per day.	**60 (iii)**	The expansion and related operation of facilities or infrastructure for the bulk transportation of dangerous goods – (iii) in solid form, outside an industrial complex or zone, by an increased throughput capacity of 50 tons or more per day.	Coal, and certain other hazardous substances will be transported by the proposed new railway within tunnel and may be classified as a dangerous good if it were to contaminate surrounding soil and water. Some existing rail infrastructure may require expansion to accommodate the new tunnel and railway. The additional throughput of coal to be transported per day is would be in excess of 50 tonnes per day from the current 71 Mtpa to 125 Mtpa.
53	The expansion of railway lines, stations or shunting yards where there will be an increased development footprint.	**64**	The expansion of railway lines, stations or shunting yards where there will be an increased development footprint.	The proposed new tunnel will be located approximately 20m from the existing tunnel. Existing railway lines will be expanded at both ends of the existing tunnel to accommodate the tie-in with the new lines. The existing rail servitude will require extension to accommodate the new tunnel.
		57	The expansion and related operation of facilities or infrastructure for the treatment of effluent, waste water or sewage where the capacity will be increased by 15000 cubic metres or more per day and the development footprint will increase by 1000 square metres or more.	The existing tunnel has a drainage facility. This facility will need to be upgraded and expanded to accommodate the new tunnel. The proposed facility includes a function to separate clean and contaminated water. The hydrogeological reports estimate that there will be an inflow of water into the tunnel of ~124m3/day. Considering this inflow it is not

NEMA Listed Activity				
				anticipated that the stormwater facility will exceed the specified thresholds.
NEMA listed activities - Government Notice R545 – Listing Notice 2 (Old Regulations)			**NEMA listed activities – Government Notice R983 – Listing Notice 2 (New Regulations)**	**Reason for Inclusion**
3	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	**4**	The development of facilities or infrastructure, for the storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	The engineering team has advised that the project will not be storing dangerous goods and consequently this activity will not be triggered.
5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	**6**	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding- (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.	Activity 28 under Listing Notice 1 of 2014 will be triggered.
11	The construction of railway lines, stations or shunting yards.	**12 (i)**	The development of railway lines, stations or shunting yards.	The proposed new tunnel will be approximately 20m from the existing tunnel.

NEMA Listed Activity				
				Some of the construction activities will be within the existing rail reserve. However, there will be a need to expand the existing servitude to accommodate the new tunnel and all its associated infrastructure. Construction of railway lines in the tunnel.
17	The extraction or removal of peat or peat soils, including the disturbance of vegetation or soils in anticipation of the extraction or removal of peat or peat soils.	**24**	The extraction or removal of peat or peat soils, including the disturbance of vegetation or soils in anticipation of the extraction or removal of peat or peat soils, but excluding where such extraction or removal is for the rehabilitation of wetlands in accordance with maintenance management plan.	Soil will be removed and vegetation disturbed during the construction of the proposed new tunnel. As the area is characterised by wetlands which will be disturbed during the construction phase the likelihood of encountering peat must be applied for.
NEMA listed activities - Government Notice R546 – Listing Notice 3			**NEMA listed activities – Government Notice R983 – Listing Notice 3 (New Regulations)**	**Reason for Inclusion**
2	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres.	**2**	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres.	The project falls within at least one of the defined geographical areas (specifically within the National Protected Area Expansion Strategy Focus (bb) and (ee) within a critical biodiversity area defined by the Mpumalanga Conservation Plan. Water supply will be required for the construction of the new tunnel. The construction is anticipated to require ~150m^3/day, and as such there is possibility that a bulk reservoir may be required.
3(a)	The construction of masts or towers of any material or type used for telecommunication broadcasting or radio transmission purposes where the mast: (a) is to be placed on a site not previously used for this purpose,	**3 (a)**	The construction of masts or towers of any material or type used for telecommunication broadcasting or radio transmission purposes where the mast or tower –	The height of the OHTE mast will be 10 m and consequently this listed activity is not triggered.

	NEMA Listed Activity			
	and (b) will exceed 15 metres in height, but excluding attachments to existing buildings and masts on rooftops.		(a) is to be placed on a site not previously used for this purpose. (b) will exceed 15 metres in height, but excluding attachments to existing buildings and masts on rooftops.	
4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres.	**4**	The construction of a road wider than 4 metres with a reserve less than 13,5 metres.	The project falls within at least one of the defined geographical areas. Access roads wider than 4 metres and with a reserve less than 13,5 metres will be required during construction and/or operation of the proposed new tunnel. The location of the proposed access roads are indicated in the footprint map in Appendix C.
10	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.	**10**	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.	The project falls within at least one of the defined geographical areas. As the project will not be storing dangerous goods this activity will not be pursued further.
12	The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.	**12**	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with maintenance management plan.	The project falls within at least one of the defined geographical areas. It is envisaged that some natural vegetation cover will be cleared during construction and specifically the stockpile area. A portion of the construction will be within a rail reserve. However, to accommodate the new tunnel, some of the agricultural land to the south of the existing rail reserve will be transformed. Approximately 50 hectares of land will be

NEMA Listed Activity				
				transformed as lay down areas and spoil areas.
13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: (1) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), in which case the activity is regarded to be excluded from this list. (2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010.			The project falls within at least one of the defined geographical areas. It is envisaged that some natural vegetation cover will be cleared during construction. A portion of the construction will be within a rail reserve. However, to accommodate the new tunnel, some of the agricultural land to the south of the existing rail reserve will be transformed. Approximately 50 hectares of land will be transformed as lay down areas and spoil areas.
14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: (1) purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes; (2) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list; (3) the undertaking of a linear activity falling below the thresholds in Notice 544 of 2010.			The project falls within at least one of the defined geographical areas. It is envisaged that some natural vegetation cover will be cleared during construction. As the area that will be cleared will be more than 5 hectares this activity is triggered.

NEMA Listed Activity				
16 (iv)	The construction of: (iv) Infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	**14 (ii); (vi); (xii)**	The development of – (ii) channels exceeding 10 square metres in size; (vi) bulk stormwater outlet structures exceeding 10 square metres in size; (xii) infrastructure or structures with a physical footprint of 10 square metres or more.	The project falls within at least one of the defined geographical areas. There are numerous wetlands and a stream in the vicinity of the proposed project. The new tunnel and associated infrastructure (e.g. rail and associated infrastructure, channels and storm water systems) will exceed 10 m^2. The proposed storm water reservoir at the Maviristad entrance of the tunnel and the associated channels as well as the expansion of the channel at the Overvaal entrance will take place either within 32 m of a watercourse
17	The expansion of reservoirs for bulk water supply where the capacity will be increased by more than 250 cubic metres.	16	The expansion of reservoirs for bulk water supply where the capacity will be increased by more than 250 cubic metres.	There will be no expansion of existing bulk supply facilities.
19	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.	**18**	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.	The project falls within at least one of the defined geographical areas. The widening and/or lengthening of existing access roads will be required. The location of the proposed access roads are indicated in the footprint map in Appendix C
24	The expansion of (c) buildings where the buildings will be expanded by 10 square metres or more in size; or (d) infrastructure where the infrastructure will be expanded by 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such	**23**	The expansion of- (i) canals where the canal is expanded by 10 square metres or more in size; (ii) channels where the channel is expanded by 10 square metres or more in size; iv) dams where the dam is expanded by 10 square metres or more in size;	The project falls within at least one of the defined geographical areas. There are numerous wetlands and a stream in the vicinity of study area resulting in considerable amounts of ground water drainage where the existing tunnel is located. The new tunnel will be approximately 20 m from the existing tunnel and thus existing infrastructure to

NEMA Listed Activity				
	construction will occur behind the development setback line.		(v) weirs where the weir is expanded by 10 square metres or more in size; (vi) bulk storm water outlet structures where the structure is expanded by 10 square metres or more in size; (x) buildings where the building is expanded by 10 square metres or more in size; (xii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;	manage the observed drainage may require expansion (e.g. canals, channels and storm water systems) to accommodate the new tunnel. Such expansion is likely to affect the surrounding wetlands and/or stream. The proposed storm water reservoir at the Maviristad entrance of the tunnel and the associated channels as well as the expansion of the channel at the Overvaal entrance will take place within 32 m of a watercourse.

In accordance with the provisions of Sections 24 (5), (M), and Section 44 of the NEMA the Minister has published regulations (GNR 543) pertaining to the required process for the conducting of EIA's in order to apply for, and be considered for, the issuing of an EA. These regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The regulations differentiate between a simpler Basic Assessment Process (required for activities listed in GNR 544 and 546) and a more complete EIA process (activities listed in GNR 545). In the case of this project there are at least four activities in GNR 545 which is triggered and as such a full EIA process is necessary. Figure 7 provides a graphic representation of the EIA process.

This EIA process is currently at the stage where the scoping report and Plan of Study for EIA (PoS) has been approved (refer to Appendix P) for a copy of the approval letter). The primary objectives of this EIA phase include:

- Comparative assessment of selected feasible alternatives;
- Detailed assessment of identified potential impacts; and
- Identification of reasonable and practicable mitigation and management measures.

This Environmental Impact Report (EIR) and an Environmental Management Programme (EMPr) represents the culmination of the EIA process.

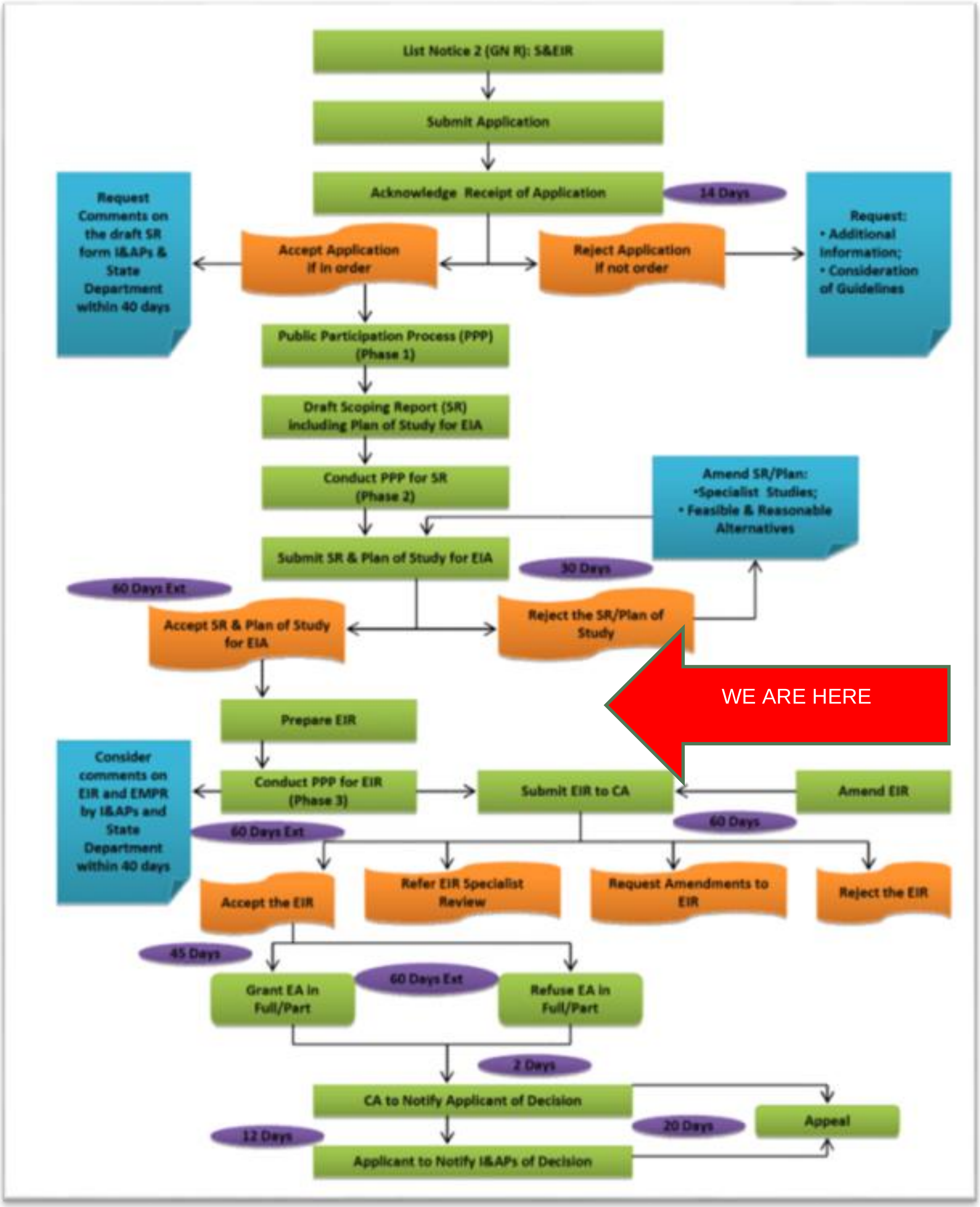

FIGURE 9: NEMA EIA PROCESS

4.2. Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)

The Minerals and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA) governs the sustainable utilisation of South Africa's mineral resources. In the event that the proposed activities require material (e.g. sand, gravel, aggregate) for the purposes of construction then the provisions of the MPRDA may apply.

In accordance with Section 5 (4) of the MPRDA: "no person may prospect for or remove, mine, conduct technical co-operation operations, reconnaissance operations, explore for and produce any mineral or petroleum or commence with any work incidental thereto without: an approved Environmental Management Programme or approved Environmental Management Plan; a representative permit or right; and notifying and consulting with the landowner or lawful occupier of the land on question".

With respect to creating borrow pits there will be a requirement for either a mining permit (less than 5ha) or a mining right (larger than 5ha) depending on the extent of the proposed borrow pit. These mining permits and rights require the compilation of an environmental management plan or an environmental management programme (including an EIA) respectively, as well as a public consultation process, prior to being considered. The decision making authority in respect of these permits / rights is the Department of Mineral Resources (DMR). At present details regarding whether additional materials will be required is not available. In the event that materials are required for construction, excluding materials that can be reused from the excavation of the tunnel, the relevant contractor will be required to obtain the necessary permits/ rights.

With regards to the reuse, and stockpiling, of the materials anticipated to be excavated from the tunnel, it is understood that no permits or rights are required under the MPRDA. EIMS has requested written confirmation of this from the DMR.

4.3. The National Water Act (Act No. 36 of 1998)

This Act sets out the fundamental principles of sustainability and equity for the protection, use and development, conservation, management and control of water resources in South Africa. The guiding principal acknowledges the basic human needs and the need to protect water resources.

Unless water uses required for the project are permissible water uses as envisaged in the NWA, or fall within the General Authorisation limits, a water use licence (WUL) will be required for those water uses referred to by submitting an application to the Department of Water and Sanitation (DWS).

Potential Section 21 water uses which are anticipated to be applicable to this project include:

- Activity 21 (a): Taking water from a water resource.
  - Applicability: During the construction and operation of the project water will be abstracted from natural water resources. This water use will be temporary for the duration of the construction process. It is

estimated that approximately 120 m^3 be required daily for a 900 day construction period, calculated as follows:

- Water for Concrete: 100,000m^3 concrete @ 170litre/ m^3 = 17 000 m^3/900 days
- Water for dust suppression on roads: = 18,000m^3 (assume 900 days construction, 2 x 10,000l water tankers per day).
- Water for tunnelling: 80 x 700 = 56,000m^3 (700 days at 80m^3/day).

- Activity 21 (c): Impeding or diverting the flow of water in a watercourse.
  - Applicability: During the construction of the railway lines and roads water courses will be crossed and will require that the flow of water in the watercourse be obstructed. The various crossings are indicated in the footprint drawings (Figure 12).
- Activity 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource.
  - Applicability: The release of contaminated storm water into dams or watercourses is classified as a 21(g) water use. This may take place through the release of contaminated storm water into the natural system. In addition the disposal of waste (rock material) from the proposed tunnel if not undertaken properly, may have negative impacts to the existing surface water bodies within and around the proposed site. This water use refers to disposing of waste in a manner that may be detrimental to a watercourse. In this regard, the management of the Coal fines trap, and silt laden water and the discharge of sediment laden water was discussed.
  - MN stated that this water use will be applicable as there would be a dirty water containment facility (as discussed in the technical presentation).
- Activity 21 (i): Altering the bed, banks, course or characteristics of a water course.
  - Applicability: the NWA Regulations defines altering as “the temporary or permanent alteration of a watercourse for…”. The available dictionary definition of alteration is, “change, revise, modify, vary, transform, adjust, adapt, convert, remodel, restyle, refashion, remould, revamp, correct, amend”. During the construction of the railway line and roads, water courses will be crossed and which may require that the banks of the water courses be changed. The various crossings are indicated in the footprint drawings (Figure 12).
- Activity 21 (j): Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.
  - Applicability: As it is the case with the existing tunnel, during operation, all water that will accumulate within the tunnel (stormwater from western portal as well as clean groundwater seepage) will be channelled in separate dirty water and clean water systems, towards existing stream that is situated

towards the east of the proposed site. During the construction of the tunnel underground water may be encountered which could impact on the construction activities and, could require that it be discharged and disposed of to ensure the finalisation of the project.

EIMS has together with Transnet and the appointed engineers, initiated a WUL application process. A pre-application meeting has been undertaken, and a formal application will be submitted shortly.

4.4. National Environmental Management: Waste Act (Act No. 59 of 2008)

The purpose of this Act is to prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources, while promoting justifiable economic and social development. In addition sustainable development requires that the generation of waste is avoided, or where it cannot be avoided, that it is reduced, re-used, recycled or recovered and only as a last resort treated and safely disposed of.

Section 19 of the Act, allows that the Minister may, by notice in the Gazette, publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. Such activities require a waste management licence. The activities listed include the following categories:

- Storage of waste;
- Reuse, recycling and recovery;
- Treatment of waste;
- Disposal of waste;
- Storage, treatment and processing of animal waste; and
- Construction, expansion or decommissioning of facilities and associated structures and infrastructure.

Each of the listed activities has an associated threshold which, if exceeded, would trigger the requirement for a waste management licence (thresholds relate to, inter alia, volumes, time, and throughputs). It is presently anticipated that listed waste management activities will be triggered by the proposed project. With reference to Section 4.1, an integrated application has been submitted to the DEA in an effort to obtain an integrated environmental authorisation covering both the NEMA and the NEMWA.

Further, and similarly to the NEMA listed activities, new listed activities (IGNR921) under the NEMWA have been promulgated subsequent to the initial Integrated Application. In this regard GNR 921 provides the following transitional arrangements:

- If a situation arises where waste management activities, listed under the previous Waste Management Activities List Notice, are listed differently under the current list of waste management activities, and a decision on such an application is still pending, such an application will still be processed by the licensing authority in accordance with this Notice, except if it is an application for a waste management activity A

3(11) or waste management activity B 4(7) listed under the previous Waste Management Activity List Notice.

TABLE 7: ANTICIPATED NEMWA LISTED ACTIVITIES.

Activity # Listed Activity Description				Reason for Inclusion
GNR 718		**GNR 921 (as amended by 332 of 2014)**		
A1	The storage, including the temporary storage of general waste at a facility, that has the capacity to store in excess of 100m^3 of general waste at any one time.	C1	The storage of general waste at a facility that has the capacity to store in excess of 100m3 of general waste at any one time, excluding the storage of waste in lagoons or temporary storage.	Some general waste will be generated during construction (i.e. excavated rock, domestic waste etc.) which will need to be stored on site prior to being re-used or disposed. The expected volumes of such waste are unknown at present.
A2	The storage, including the temporary storage of hazardous waste at a facility that has the capacity to store in excess of 35m^3 of hazardous waste at any one time.	B1	The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.	Some accidental contamination of soil and other substrates (e.g. fuel, concrete wash water, carboniferous materials, etc.) may occur during construction, and this hazardous waste will need to be temporarily stored on site prior to disposal. The nature and volumes of such waste are unknown at present. Further the operational phase includes a stormwater system that is designed to collect clean and dirty water. The dirty water is separated and passed into an evaporation system with a coal fines filter. The collected coal fines could be regarded as hazardous waste.
A3	The storage, including the temporary storage of general waste in lagoons.	A1	The storage of general waste in lagoons.	Some general waste (incl. inert waste) may be stored temporarily on site during construction. Spoil material excavated from the tunnel will be temporarily stored before it will be re-used as fill material, if it found to be acceptable
A5	The sorting, shredding, grinding or bailing of general waste at a facility that has the capacity to process in excess or one ton of general waste per day.	A2	The sorting, shredding, grinding, crushing, screening or bailing of general waste at a facility that has an operational area in excess of 1000m^2	Some general waste (incl. inert waste) will be produced during construction and may need to be sorted & shredded on site. The exact amounts and processes are unknown. Also, Waste rock will be sorted on site to determine the suitability as construction material.
A7	The recycling or re-use of general waste of more than 10 tons per month.	A3	The recycling of general waste at a facility that has an operational area in excess of 500m^2.	General waste will be produced during the construction of the proposed new tunnel; some of this waste (e.g. waste rock) may be re-used on and/or off site. It is anticipated that ~1 000 000 m^3 of waste rock will need to be
		B3	The recovery of waste including the refining, utilisation, or co-processing of the waste at a facility that processes in excess of 100 tons of general	

			waste per day or in excess of 1 ton of hazardous waste per day…	stockpiled indefinitely (disposed of). Only a small amount of this is anticipated to be reused/ utilised during the construction.
A14	The disposal of inert waste in excess of 25 tons and with a total capacity of 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised by or under other legislation.	B9	The disposal of inert waste to land in excess of 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised under other legislation.	It is anticipated that ~1 000 000 m^3 of waste rock will need to be stockpiled indefinitely (disposed of). Only a small amount of this is anticipated to be reused during the construction.
A15[3]	The disposal of general waste to land covering an area of more than $50m^2$ but less than $200m^2$ and with a total capacity not exceeding 25 000 tons.			Some general waste including domestic waste produced during construction may need to be disposed to a licensed dump site. The waste rock material that needs to be disposed of exceeds this threshold.
A16	The disposal of domestic waste generated on premises in areas not serviced by the municipal service where the waste disposed does not exceed 500kg per month.			Domestic waste will be produced during construction and operation of the proposed new tunnel. The exact volumes and disposal options are unknown at present. General wastes generated during construction will be stored and disposed of at a suitably licenced facility.
A18	The construction of facilities for activities listed in Category A of this Schedule (not in isolation to associated activity).	A12	The construction of a facility for a waste management activity listed in Category A.	Waste management activities have been triggered and therefore the construction of such associated facilities (including the stockpile area, the coal fines trap, and the storage areas for construction phase) are included and will need to be authorised.
A19	The expansion of facilities of or changes to existing facilities for any process or activity, which requires an amendment of an existing permit or license or a new permit or license in terms of legislation governing the release of pollution, effluent or waste.			The existing tunnel has a drainage facility. This facility will need to be upgraded and expanded to accommodate the new tunnel. The proposed facility includes a function to separate clean and contaminated water. The hydrogeological reports estimate that there will be an inflow of water into the tunnel of ~124m3/day. It is anticipated that a Water Use Licence will be required for the release of the effluent.
B10	The disposal of general waste to land covering an area in excess of $200m^2$.	B8	The disposal of general waste to land covering an area in excess of 200m2 and with a total capacity exceeding 25 000 tons.	It is anticipated that ~1 000 000 m3 of waste rock will need to be stockpiled indefinitely (disposed of).
B11	The construction of facilities or activities listed in	B10	The construction of a facility for a waste	Waste management activities have been

[3] ITEMS IN BLUE TEXT ARE NO LONGER APPLICABLE TO THIS APPLICATION

	Category B of this Schedule (not in isolation to associated activity).		management activity listed in Category B of this schedule,	triggered and therefore the construction of such associated facilities (including the stockpile area, the coal fines trap, and the storage areas for construction phase) are included and will need to be authorised.

It is further important to consider the provision of Section 16 of the Act which requires that:

- *" A holder of waste must, within the holders power, take all reasonable measures to-*
  - a. *avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;*
  - b. *reduce, re-use, recycle and recover waste;*
  - c. *where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;*
  - d. *manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;*
  - e. *prevent any employee or any person under his or her supervision from contravening the Act; and*
  - f. *prevent the waste from being used for unauthorised purposes*."

These general principles of responsible waste management will be incorporated into the requirements in the EMPr to be implemented for this project.

4.5. National Environmental Management: Air Quality Act (Act No. 39 of 2004)

The National Environmental Management: Air Quality Act (NEMAQA) is the main legislative tool for the management of air pollution and related activities. The Object of the Act is:

a) to protect the environment by providing reasonable measures for-

   i. the protection and enhancement of the quality of air in the republic;

   ii. the prevention of air pollution and ecological degradation; and

   iii. securing ecologically sustainable development while promoting justifiable economic and social development; and

b) Generally to give effect to Section 24(b) of the constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and wellbeing of people.

Section 21 of the NEMAQA allows that the Minister to publish a list of activities which may result in atmospheric emissions and which may have a significant detrimental effect on the environment. The NEMAQA further requires that no person may, without a provisional atmospheric emissions licence or an atmospheric emissions licence conduct an activity which is listed in accordance with Section 21.

One of the NEMAQA listed activities relates to the storage of ore. As the project will not be storing coal, and the spoil excavated from the tunnel does not fulfil the definition of "ore" it is anticipated that an air emissions licence will not be triggered. Based on the available geological information it is anticipated that some carboniferous material may be excavated (primarily at the western portal). It is anticipated that this material will not be of significant volume and will be managed responsibly according to the EMPr. Of specific importance for the proposed project is the potential for the activity to result in the generation of dust and smoke emissions.

In terms of the GN R. 827 of 1 November 2013 as promulgated under the National Environmental Management Act: Air Quality Act, 2004 (Act No. 39 of 2004), a standard for the acceptable dust fall rate is as stipulated in Table 8 below for residential and non-residential areas.

TABLE 8: ACCEPTABLE DUST FALL RATES (GN R. 827).

Restriction area	Dust fall rate (D) (mg/m^2/day, 30-days average)	Permitted frequency of exceeding dust fall rate
Residential area	D < 600	Two within a year, not sequential months.
Non-Residential area	600 < D < 1200	Two within a year, not sequential months.

Section 32 of the NEMAQA also makes reference to the fact that the Minister may inter alia prescribe measures for the control of dust and measures to be taken to prevent nuisance caused by dust. In addition Section 9(1) of the NEMAQA makes allowance for the Minister to publish a list of national ambient air quality standards to be implemented throughout South Africa. GN R. 1210 of December 2009 provides these standards for various ambient pollutants. With respect to the proposed project, the notice makes provision for an ambient air quality standard for Particulate Matter (i.e. dust) as presented in Table 9. Transnet must ensure that these ambient standards are met during construction and operation.

TABLE 9: NATIONAL AMBIENT AIR QUALITY STANDARD FOR PARTICULATE MATTER.

Averaging period	Concentration	Frequency of exceedance	Compliance date
24 hours	120 $\mu g/m^3$	4	Immediate- 31 December 2014
24 hours	75 $\mu g/m^3$	4	1 January 2015
1 year	50 $\mu g/m^3$	0	Immediate – 31 December 2014
1 year	40 $\mu g/m^3$	0	1 January 2015
The reference method for the determination of the particulate matter fraction of suspended particulate matter shall be EN12341			

4.6. Environment Conservation Act (Act No. 73 of 1989)

Environment Conservation Act (Act 73 of 1989) (ECA) was, prior to the promulgation of the NEMA, the backbone of environmental legislation in South Africa. To date the majority of the ECA has been repealed by various other

Acts, however Section 25 of the Act and the Noise Regulations (GN R. 154 of 1992) promulgated under this section are still in effect. These regulations serve to control noise and general prohibitions relating to noise impact and nuisance.

The noise control regulations will need to be considered by the applicant (refer to Table 9) in relation to the potential noise that may be generated during the construction of the proposed project and railway lines. The two key aspects of the noise control regulations relate to disturbing noise and noise nuisance.

TABLE 10: TYPICAL RATING LEVELS FOR NOISE IN DISTRICTS (SANS 10103:2008)

Type of district	Equivalent Continuous Rating Level for Noise (LReq,T) (dBA)					
	Outdoors			Indoors (with windows open)		
	DayNight (LR,dn)	Daytime (Lreq,d)	Nighttime (Lreq,n)	DayNight (LR,dn)	Daytime (Lreq,d)	Nighttime (Lreq,n)
a) Rural	45	45	35	35	35	25
b) Suburban (with little road traffic)	50	50	40	40	40	30
c) Urban	55	55	45	45	45	35
d) Urban (with one or more of the following: workshops; business premises; and main roads)	60	60	50	50	50	40
e) Central business district	65	65	55	55	55	45
f) Industrial district	70	70	60	60	60	50

Section 4 of the regulations prohibits a person from making, producing or causing a disturbing noise, or allowing it to be made produced or caused by any person, machine, device or apparatus or any combination thereof. A disturbing noise is defined in the regulations as 'a noise level which exceeds the zone sound level or if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

Section 5 of the noise control regulations in essence prohibits the creation of a noise nuisance. A noise nuisance is defined as 'any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person'. Noise nuisance is anticipated from the proposed project particularly to those residents that are situated in close proximity to the project site. Noise was part of the EIA Phase investigations undertaken by PGS Heritage (Pty) Ltd, for inclusion in the overall EIAR and EMPr for the Proposed New Overvaal Tunnel (see Appendix I for full report).

South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with the ECA noise regulations.

4.7. National Forests Act (Act No. 84 of 1998)

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that ' no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.

No protected trees are anticipated within the vicinity of the proposed project due to the fact that the area has been disturbed through grazing and agricultural activities. However it is recommended that proper mitigation be implemented to protect those trees if encountered when selecting sites for construction camps and lay down areas.

4.8. National Environmental Management: Biodiversity Act (Act No. 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004)(NEMBA), 'provides for: the management and conservation of South Africa's biodiversity within the framework of the NEMA; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute (SANBI); and for matters conducted therewith".

In terms of the Biodiversity Act, Transnet has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorization of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Regulations published under the NEMBA also provides a list of protected species, according to the Act (GN R. 151 dated 23 February 2007, as amended in GN R. 1187 dated 14 December 2007). Section 57 of NEMBA identifies restricted activities involving threatened or protected species. Restricted activities include the gathering, collecting, cutting, uprooting, damaging or destroy a listed species. Listed orchid species occur in the project area which will have to be moved from those areas affected by construction.

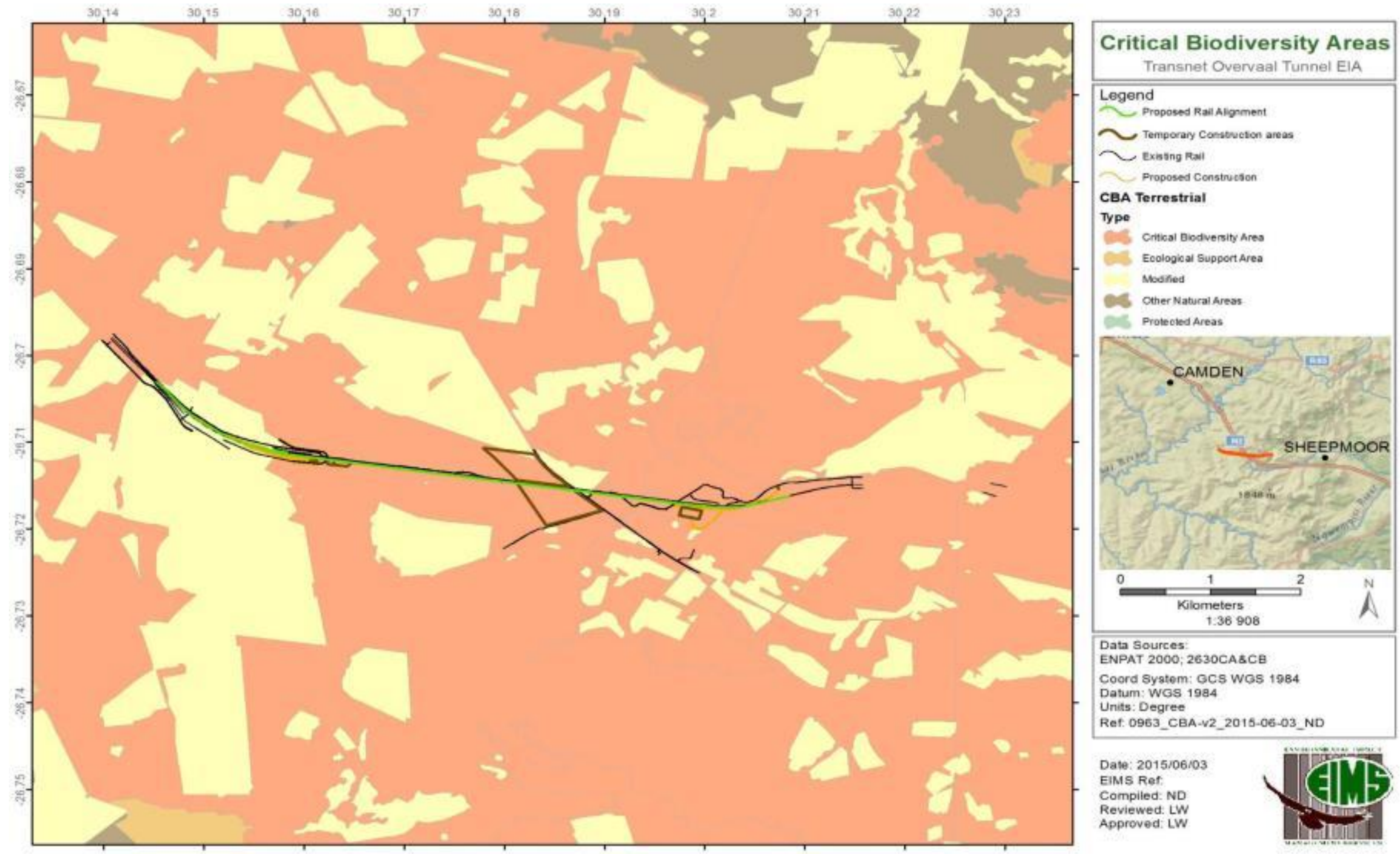

FIGURE 10: VIEW OF TERRESTRIAL ECOSYSTEM WITHIN THE PROJECT SITE (SANBI).

4.8.1. NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT: ALIEN AND INVASIVE SPECIES LIST (2014)

This Act is applicable since is protect the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

- Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of Section 70(1)(a) of the Act as species which must be combated or eradicated.
- Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of Section 70(1)(a) of the Act as species which must be controlled.
- Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of Section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.
- Category 3 Listed Invasive Species: Category 3 Listed Invasive Species are species that are listed by notice in terms of Section 70(1)(a) of the Act, as species which are subject to exemptions in terms of Section 71(3) and prohibitions in terms of Section 71A of Act, as specified in the Notice.

According to the Ecological assessment undertaken for the proposed project, only one alien invasive species in terms of the Conservation of Agricultural Resource Act (No 43 of 1983) was recorded within the plots surveyed, namely *Campuloclinium macrocephalum*. This alien invasive species is a Category 1 plant which implies they “are weeds and serve no useful economic purpose and possess characteristics that are harmful to humans, animals or the environment.” Category 1 species have to be controlled.

Although not recorded within the plots surveyed, alien invasive woody species where noted, and these include Black Wattle (*Acacia mearnsii*) – a category 1 species and Bluegum (Eucalyptus species) – mainly category 2 species. Category 2 species needs to be controlled outside demarcated areas. The Wattles and Bluegums are also mainly category 2 in terms of the same act, which implies they are invasive species which are regulated by area, however the Bluegums qualify for Category 1b when they are close to water sources (riparian or wetland areas) or in protected or threatened ecosystems.

Therefore an alien control plan will be a crucial component of the Environmental Management Plan to ensure that topsoil containing seed contaminated with alien invasive species are not introduced to the proposed project study area.

4.9. The National Heritage Resources Act (Act No. 25 of 1999)

South Africa, which are of cultural significance or other special value by introducing an integrated and interactive system for the management of national heritage resources.

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34 (1) of the NHRA states that "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…". NEMA Section 23 (2) (b) states that integrated environmental management should "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage".

Section 38 of the NHRA states that any person who intends to undertake a linear development exceeding 300m in length must at the earliest stages of the development, notify the responsible Heritage Resources Authority and furnish them with details regarding the location, nature, and extent of the proposed development. The Responsible Heritage Resource Authority could, within 14 days of receipt of such notification; request a heritage impact assessment (HIA) if there is any reason to believe that the heritage resources in the area may be affected.

The South African Heritage Resources Authority (SAHRA), as the responsible Heritage Resources Authority, was notified of the proposed project. A specialist phase 1 heritage impact assessment has been conducted for this project and the findings incorporated into the EIA process. In terms of the SAHRA Paleontological map this area is of high paleontological importance and require a Phase 1 paleontological study to inform the EIA process.

4.10. The South African National Roads Agency Limited And National Roads Act (Act No. 7 of 1998)

The South African National Roads Agency Limited (SANRAL) and National Roads Act (Act 7 of 1998) makes provision for a national roads agency for the Republic to manage and control the Republic's national roads system and take charge, amongst others, of the development, maintenance and rehabilitation of national roads within the framework of government policy; for that purpose to provide for the establishment of SANRAL; to prescribe measures and requirements with regard to the Government's policy concerning national roads, the declaration of national roads by the Minister of Transport and the use and protection of national roads; to repeal or amend the provisions of certain laws relating to or relevant to national roads; and to provide for incidental matters.

The Act provides for certain processes and procedures which should be followed in the event that any structures are erected on or within the defined 'building restriction area' of a National Road. In this regard EIMS has included SANRAL as a pre-identified key Interested and Affected Party (I&AP), however to date no comments have been received. The proposed project is traversed on the eastern side by the N2 road (falling under the jurisdiction of this Act). The provisions of this Act will be applicable and must be considered by Transnet.

4.11. The Constitution (Act No. 108 of 1996)

Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

The public's right to be involved in decisions that may affect them is enshrined in the South African Constitution. Section 57(1) of the new Constitution provides that: "The National Assembly may (b) make rules and orders concerning its business, with due regard to representative and participatory democracy, accountability, transparency and public involvement".

This provision, along with several others gave rise to many new trends in South African legislation. In environmental legislation, the idea of public participation (or stakeholder engagement) features strongly and especially the National Environmental Management Act (Act No. 107 of 1998 - NEMA) and the recent regulations passed under the auspices of this Act makes very strict provisions for public participation in environmental decision-making.

Public participation can be defined as "a process leading to a joint effort by stakeholders, technical specialists, the authorities and the proponent who work together to produce better decisions than if they had acted independently" (Greyling, 1999, p. 20). From this definition, it can be seen that the input of the public is regarded as very important indeed.

4.12. Mpumalanga Roads Act, (Act No. 1 of 2008)

The main objectives of the act include the following:

- To provide for the establishment, transformation, restructuring and control of the Mpumalanga Provincial road network;
- To develop and implement Provincial road policy and standards; to provide for optimum road safety standards, efficient and cost-effective management of the Provincial road network, the maintenance of Provincial roads assets and the provision and development of equitable road access to all communities within the Province;
- To provide for transparency in the development and implementation of the Provincial road network policies and practices; and to provide for matters connected therewith.

Mpumalanga Department of Public Works, Roads and Transport (MDPWRT), have been included as I&AP.

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

This section of the report will provide a description of the study area in terms of Physical, Biological, Socio-economic and Cultural components of the receiving environment.

5.1. Physical Environment

5.1.1. CLIMATE

The proposed project will be situated on the Highveld in the Mpumalanga Province. The area is characterized by cool, dry winters (May to August) and warm, wet summers (October to March), with April and September being transition months. The Mean Annual Precipitation (MAP) in the vicinity of the site was calculated to be 757 mm. About 85% of the annual rainfall falls in summer (October to March), in the form of showers and thunderstorms, with the maximum amount of precipitation falling in January. (http://www.weathersa.co.za).

5.1.1.1. TEMPERATURE

Average monthly minimum and maximum temperatures for the Ermelo weather station (No 0479870X) are shown in TABLE 11. Average daily maximum and minimum summer temperatures (November to February) at the weather station range between ~29°C and ~32°C, while winter temperatures (May to August) range between ~23°C and ~26°C respectively (South African Weather Service).

TABLE 11: TEMPERATURE DATA FOR ERMELO FOR 2010 OBTAINED FROM THE SOUTH AFRICAN WEATHER SERVICE (STATION NO 0479870X)

Month for the year 2010	Temperature (°C)	
	Average Daily Maximum	Average daily Minimum
January	29.5	12.4
February	29.1	8.8
March	28	9.1
April	25.7	2.5
May	23.6	3.3
June	23.7	1.3
July	23.1	-0.9
August	26.1	5.2
September	30.5	2.1
October	32	6.8
November	32.6	5.7
December	33	8.3

5.1.1.2. WIND

As per the South African Weather Services, dominant wind is from the west north west which blows approximately 15% of the time, with winds exceeding 5.7m/s, with other prevailing winds from the north west (11%) and west (9%). A secondary wind field blowing from the east (10%) and east south east (9%) are also noted, indicating a general wind reversal trend for the wind profile. The area does not experience strong winds, with the maximums not exceeding 8.8m/s.

5.1.1.3. MEAN ANNUAL PRECIPITATION

The average rainfall of the area surrounding the proposed project is ~750 mm per annum, (Msukaligwa Spatial Development Framework, 2010).

5.1.2. GEOLOGY AND SOIL

According to Mucina & Rutherford, 2006 the Eastern Highveld Grassland is comprised of red to yellow sandy soil of the Ba and Bb land types found on shale's and sandstones of the Madzaringwe formation (Karoo Supergroup) (refer to Figure 12). On the other hand the Wakkerstroom Montane Grassland is comprised of the mudstones, sandstones and shale of the Madzaringwe and Volkrust (Karoo Supergroup) were intruded by voluminious Jurassic dolerite dykes and sills. Ac land type is dominant, while Fa and Ca are of subordinate importance.

The tunnel and immediate surrounding areas are underlain by sedimentary rocks of the Vryheid Formation of the Ecca Group (member of the Karoo Supergroup). The Vryheid sediments comprise out of shale, carbonaceous shale, coal and sandstones layers.

This vryheid formation has been intruded by a massive dolerite sill (more than 100m thick), while localised faulting is evident, displacements are generally slight. Around the overvaal portal side there is a thin layer of quaternary sediments overlying the vryheid sediments which supports the wetlands. A cross-sectional view of this stratigraphy portion is visible at the overvaal tunnel portal in a photo presented in **Figure 11**.

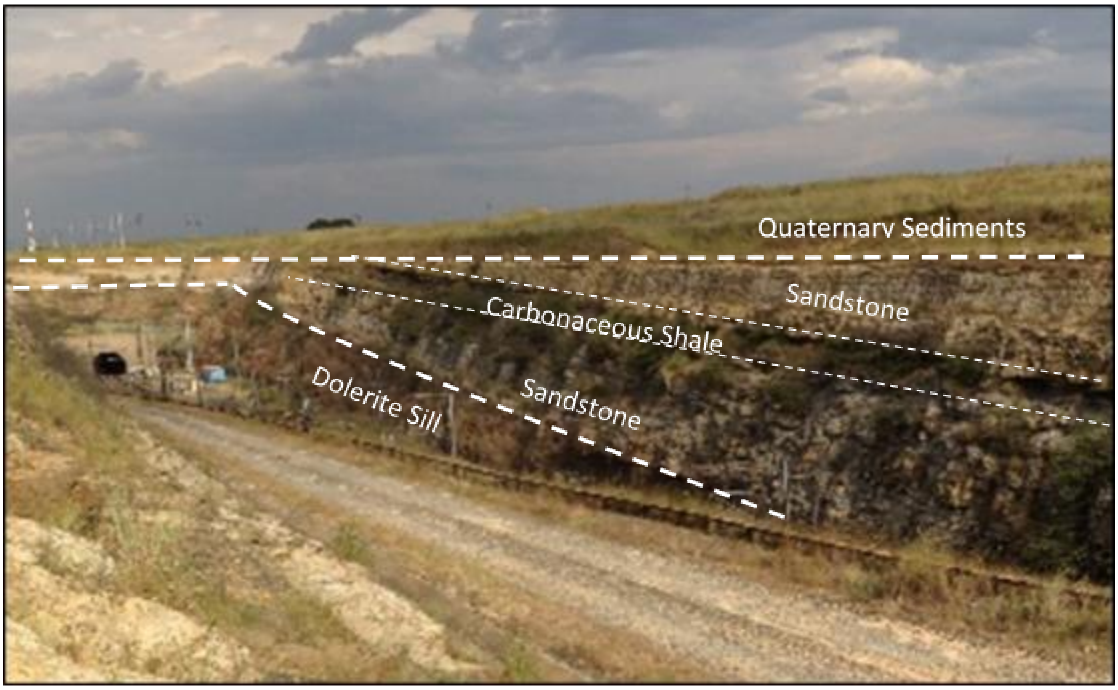

FIGURE 11: VIEW OF THE EXISTING OVERVAAL TUNNEL PORTAL (LOOKING SOUTH-EAST) (GCS; 2015).

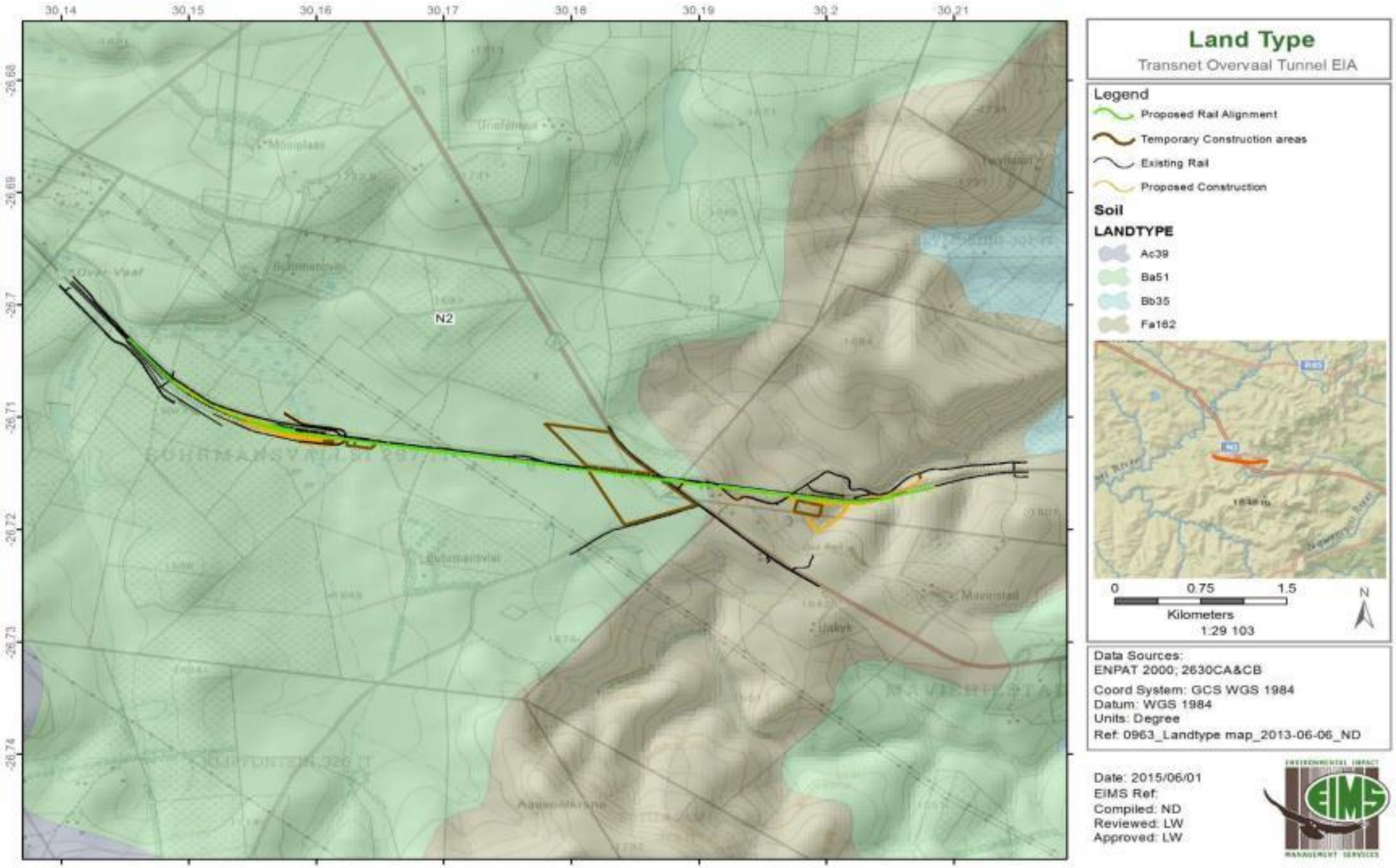

FIGURE 12: VIEW OF LAND TYPES CHARACTERISING OF THE PROPOSED PROJECT SITE.

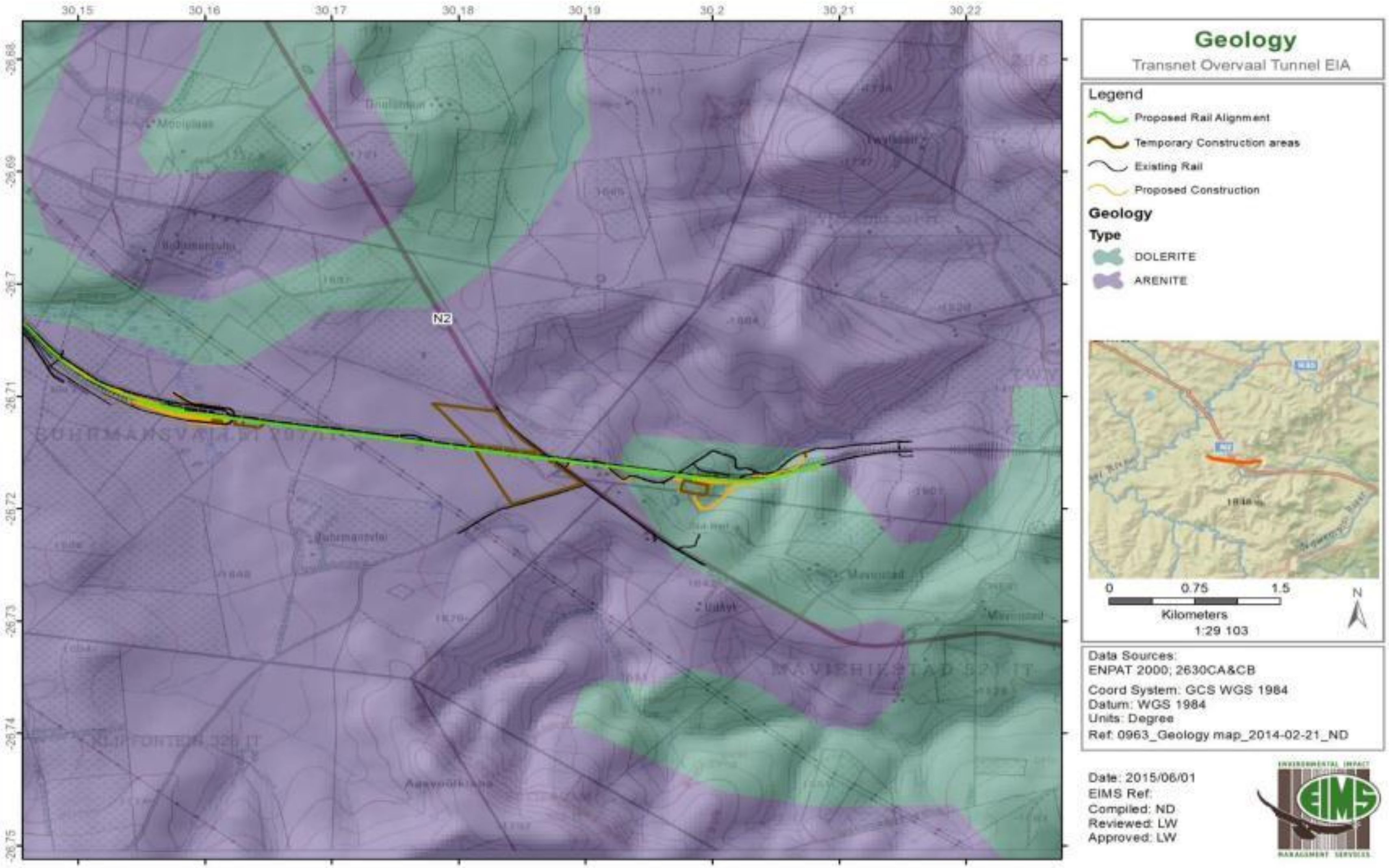

FIGURE 13: GEOLOGICAL CHARACTERISTICS OF THE PROPOSED PROJECT SITE.

Faulting is evident in the area and the drainage paths observed on the surface topography are considered to be controlled by the structural geology, (Jones and Wagener, 2010). The borehole data supports the information from the construction of the existing tunnel in that the dolerite sill is massive and that the proposed project will also be located entirely within the dolerite sill. Please refer to P for a comprehensive geotechnical investigation undertaken for the project.

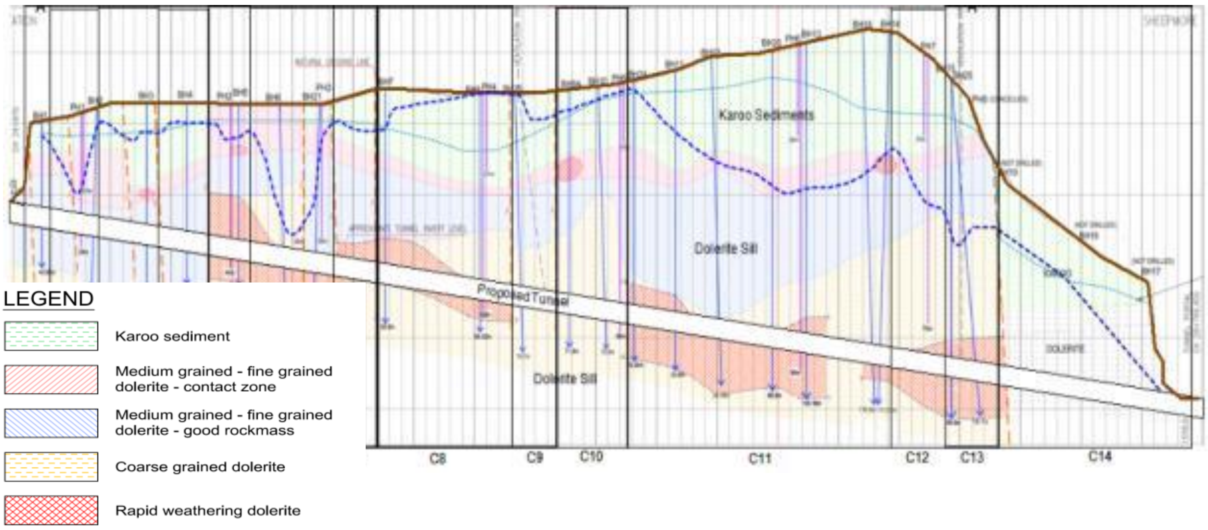

FIGURE 14: ANTICIPATED GEOLOGICAL PROFILE- (SOURCED FROM CONCEPTUAL SITE MODEL -GCS; 2015).

5.1.3. TOPOGRAPHY

The proposed project is situated in an area that is characterised by a rolling to undulating topography (refer to Figure 27 and **Figure 15**). The general surface elevation along the proposed project route ranges from 1641 mamsl to 1656 mamsl (metres above mean sea level) in the west and central section's increasing to approximately 1665 mamsl at the N2 and then decreasing rapidly to 1590 mamsl eastwards, (Jones & Wagener, 2010). Localised well defined drainage channels located along the route, drain in a north easterly direction.

FIGURE 15: TOPOGRAPHY OF THE STUDY AREA, PHOTO OF THE EASTERN PORTION OF THE PROPOSED SITE (GCS; 2015).

5.1.4. HYDROLOGY (SURFACE WATER)

A surface water specialist investigation and report has been undertaken for this EIA. A summarised description of the nature of the receiving environment is presented herein- please refer to the full specialist report for further details (Appendix G).

The hydrological characteristics of the receiving environment can be described in terms of the surface water features and the ground water features found in the vicinity of the proposed project. The proposed project site falls within both the Upper Vaal WMA (proposed Vaal WMA) and Usuthu – Inkomati - Usuthu WMA (used to be called Usuthu - Mhlathuze WMA, (refer to Figure 16). The major rivers traversing the municipal area include the Vaal, Klein Vaal, Waterval, Slang, Sandspruit, Olifants, Komati, Seekoeispruit, Usutu, Ngwempisi, Hlelo, Assegaai, Wit, and Phongolo. Stretches of both the Vaal and Phongolo River, largely form the southern boundary of the District. These feed into a number of prominent dams distributed throughout the District, namely the Nooitgedacht, Vygeboom, Jericho, Hey/Shope, Grootdraai and a part of the Vaal Dam adjoining the south-western corner of the District.

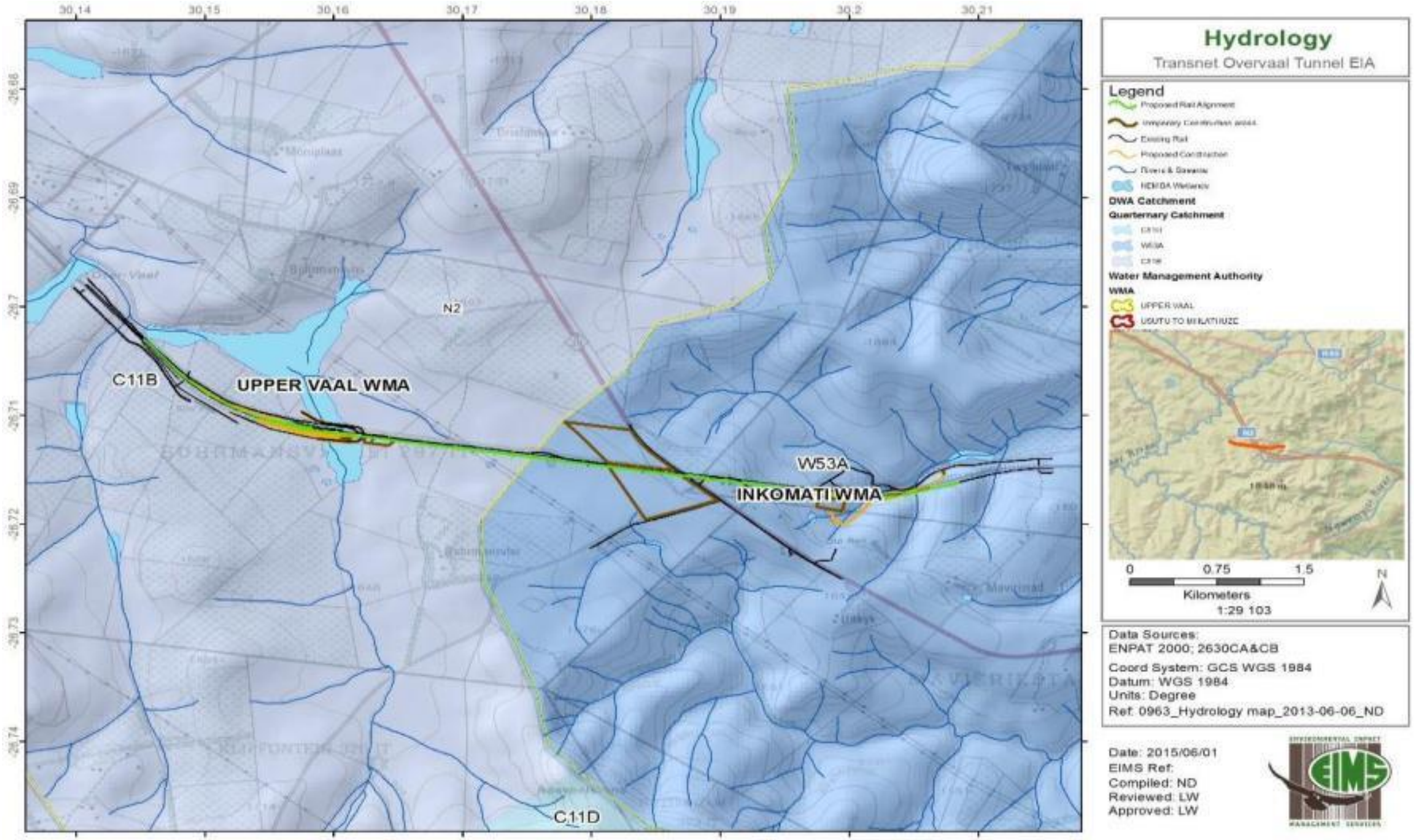

FIGURE 16: HYDROLOGICAL CHARACTERISTICS OF THE PROPOSED PROJECT SITE.

Apart from the general drainage system, the district is known for its numerous wetlands and pans. These generally dominate the surrounding areas of Chrissiesmeer and Wakkerstroom. Importantly, wetlands not only contain high species diversity, but play a significant ecological role. Furthermore, wetlands function as landscape amenities by helping with hydrologic management, flood attenuation, stormwater control, erosion control, and pollution control. Consequently, wetland areas should be avoided for development purposes (Gert Sibande District Municipality SDF, 2009).

With regards to the surface water features there are a number of drainage systems around the proposed project site that drain into the Vaal River and Usutu River. The proposed project site is located in the Vaal River Catchment upstream of the Grootdraai Dam and the Great Usutu River catchment upstream of the Morgenstond Dam. The proposed project site is situated in the C11B quaternary sub-catchment of the Vaal River primary catchment and W53A quaternary catchment of the Great Usutu River. According to the ecological importance classification for the two quaternary catchments (C11B and W53A) in the area (refer to Figure 16), the systems in the area can be classified as sensitive to moderately sensitive in terms of ecological importance and sensitivity.

As part of the specialist surface water investigation an attempt was made to determine the quality of the surface water in the local surface water resources. The water sample analysed indicates good water quality, all tested parameters are below the set guideline and standard limits. It must be noted that only one sample was taken and that these results only act as a snapshot of the water quality in the stream. It is therefore recommended that a monthly monitoring programme be setup to monitor the in-stream water quality.

Further the specialist surface water study also identified the extent of potential flood lines associated with the surface water resources in the vicinity of the proposed project (refer to **Figure 28** and FIGURE 29). These are indicated in, and described in detail, in the Specialist Report (Appendix G).

5.1.5. WETLANDS

A specialist wetland assessment has been undertaken for the project. This section presents relevant extracts from this study. Please refer to Appendix H for the full report and supporting information.

5.1.5.1. DELINEATED AND CLASSIFIED WATERCOURSES

Numerous drainage lines, particularly first and second order drainage lines, are present within the study area, as indicated on the 1:50000 topographical map (2630CA). This includes the Sterkspruit drainage line located in the far western section of the study area. The area also overlaps with wetland habitat indicated on the National Freshwater Ecosystem Priority Area (NFEPA) spatial dataset of 2011, especially in the western half, that drains towards the Upper Vaal Water Management Area. The same area is highlighted as a wetland that is regarded as a Critical Biodiversity Area in the MBSP (2013). Several wetlands are demarcated within the study area, as indicated on the recently completed Mpumalanga Highveld Wetlands layer (SANBI, 2014), which represents a new wetland inventory for a selected area within Mpumalanga Province.

A Topographical Wetness Index model was created to illustrate potential areas with increased soil moisture conditions within the site and its surroundings. The model utilises the land form wetland indicator (DWAF, 2005). This map was used to help target transect and other surveys during the site visits. Areas with expected increased wetness correlated well with wetland areas indicated in the Mpumalanga Highveld Wetlands layer. Wetland and other watercourses are therefore suspected to be present within the study area based on available and modelled data. Site surveys confirmed the presence of well-defined wetland habitat within the area, particularly the western portion of the study area that falls within the Upper Vaal Water Management Area (WMA).

Riparian habitat, delineated as riparian stream, are absent in the Upper Vaal WMA section of the study area, but do occur in the steeper terrain of the eastern section of the study area, located within the Inkomati – Usuthu WMA. A combined watercourse area of 380.49 ha was delineated in the Upper Vaal WMA section of the study area (wetlands and dams), and is significantly larger compared to the combined watercourse area of 19.25 ha in the Inkomati – Usuthu WMA (wetlands, riparian streams and dams).

Identified riparian streams form a continuum with wetland habitat and also display wetland features in some instances, such as mottling and spots of iron depletion on the incised channel banks of Riparian stream no. 3 (Figure 17). Watercourses delineated as riparian streams do however appear to function more like riparian systems rather than wetlands, due to the presence of steeper gradients, shallower soil development (excluding Riparian stream no. 3), less time for inundation and soil saturation, and features associated with higher energy flows, such as incised channel development, bank scour, root exposure and deposited sediment (alluvial material) in the channel bed. Some aquatic ecologists may however interpret these watercourses as channelled valley bottom wetlands. The presence of woody tree species in watercourses in the Inkomati – Usuthu WMA are mainly associated with exotic wattles and not with the presence of indigenous riparian species. Exceptions include species, such as *Buddleja salviifolia* in Riparian stream no. 3.

Trees, shrubs and seedlings of the invasive aliens *Acacia dealbata* and *A. mearnsii* occur in both wetland and riparian areas within the Inkomati – Usuthu WMA. Hydromorphic wetland features recorded across the study area include mottling, spots of iron depletion, low chroma matrix colours, gleying and organic enrichment in the A horizon. Organic enrichment, mottling and spots of iron depletion were regularly recorded within the top 0.5m of wetland associated soil profiles, while gleying generally occurred at deeper depths, but were also occasionally present within the first 0.5m of selected profiles.

Possible wetland associated soil forms that are present in the area, particularly in the western Upper Vaal WMA portion of the study area, include suspected Avalon, Pinedene, Westleigh, Longlands, Kroonstad, Fernwood, and Katspruit soils.

Temporary, seasonal and permanent zones of wetness were identified based on soil features and the presence of different hygrophyte and hydrophyte species. The majority of delineated wetland areas were dominated by well-developed to marginal temporary wetness zones, with smaller areas of seasonal and even smaller areas of permanent wetness. Localised points of permanent wetness were identified at suspected springs near the upper margins of selected wetlands in the Upper Vaal WMA. Investigated springs were converted into small dams with sickle shaped earth berms around their lower margins. The suspected springs were characterised by organic-rich soils, which may even contain localised peat substrates. The occurrence of peat was not confirmed on site and is expected to be marginal at best, if it does occur.

5.1.5.1.1. WETLANDS IN INKOMATI-USUTHU WMA

Watercourses with a total area of 19.25 ha was delineated within the Inkomati - Usuthu WMA; wetland areas cover 6.97 ha, riparian streams cover 8.86 ha and dams cover 3.42 ha. Delineated wetland areas in the Inkomati - Usuthu WMA can be classified into two types of hydro-geomorphic (HGM) units. The number and combined size of type HGM wetland unit delineated in the Inkomati - Usuthu WMA include the following:

- One channelled valley bottom wetland (area of 0.59 ha); and
- Four seep wetlands (combined area of 6.38 ha).

Riparian watercourses that largely lack wetland features are present within the Inkomati- Usuthu WMA portion of the study area. These watercourses include a larger riparian stream with some wetland features (Riparian steam no. 3) and three first-order headwater riparian streams (no 1, 2 & 4) on steep slopes that are more ephemeral in nature (Figure 17). A single headwater drainage line was identified as part of the desktop assessment in the Inkomati - Usuthu WMA. The exact nature of this drainage line remains uncertain, but wetland and distinct riparian features are expected to be absent. A natural channel with regular or intermittent flow is however expected to be present. The drainage line is therefore regarded as a watercourse. It is worthwhile to mention that other wetland specialists or aquatic ecologists may also have regarded riparian streams no 1, 2 and 4 as non-riparian headwater drainage lines or potentially as channelled valley bottom wetlands. Some uncertainty therefore exists regarding the most appropriate watercourse category (i.e. natural channel with regular or intermittent flow versus riparian habitat versus channelled valley bottom wetland).

5.1.5.1.2. WETLANDS IN UPPER VAAL WMA

Wetland and dam watercourses were identified and delineated in the Upper Vaal WMA. Wetlands cover a significantly larger area (379.55 ha). A single dam with a size of 0.94 ha was identified in the western-most section of the study area, while no riparian streams are present (Figure 17). Delineated wetland areas in the Upper Vaal WMA can be classified into three types of hydro-geomorphic (HGM) units. The number and combined size of each type HGM wetland unit delineated in the Upper Vaal WMA consists of the following:

- One channelled valley bottom wetland (combined area of 1.90 ha)
- Three unchannelled valley bottom wetlands (combined area of 83.20 ha)

- Five seep wetlands (combined area of 294.45 ha)

All of the delineated wetlands and most of the riparian watercourses present within the study area have been assigned a unique map label number to identify a specific wetland or riparian watercourse.

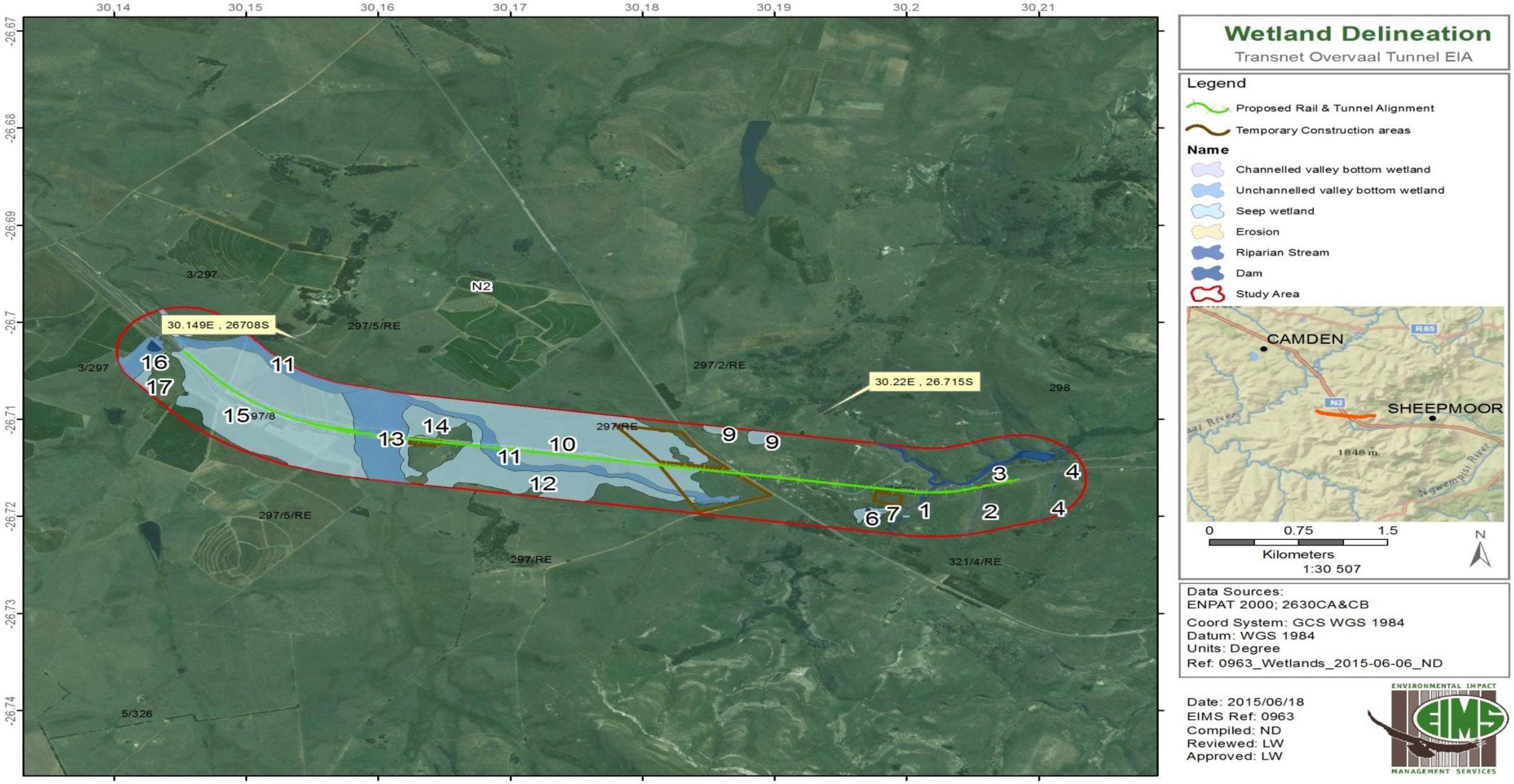

FIGURE 17: DELINEATED AND NUMBERED WATERCOURSES (NO.01-18), LOCATED IN THE STUDY AREA THAT FALLS WITHIN BOTH INKOMATI TO USUTHU WMA AND THE UPPER VAAL WMA. (GROBLER; 2015).

5.1.5.2. PRESENT ECOLOGICAL STATE (PES) & ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) ASSESSMENTS OF DELINEATED WATERCOURSES

Wetland and riparian watercourses delineated in each of the two water management areas are described separately in terms of their features, impacts, functions, ecological condition (PES) and conservation value (EIS). Emphasis is placed on watercourses that overlap with the proposed project layout.

PES categories for assessed wetlands and riparian streams were determined through different techniques, but made use of the same six classes. EIS categories range between Very high to Low and are dependent on aspects, such as the presence of unique features, species of conservation concern, protected vegetation units or ecosystems, sensitivity to flooding and changes in water quality, the rarity of the watercourse type, and the general ecological condition of the watercourse and its surrounding catchment.

5.1.5.2.1. WETLAND AND RIPARIAN WATERCOURSES IN THE INKOMATI – USUTHU WMA

The Present Ecological State (PES) scores of assessed watercourses range between **'Largely natural' (Class B) to 'Largely modified/ Seriously modified' (Class D/E)**, while Ecological Importance and Sensitivity (EIS) values for the same wetlands and riparian areas range between **High to Moderate/ Low** (**Table 12**).

TABLE 12: DETERMINED PES AND EIS SCORES FOR DELINEATED WETLANDS AND RIPARIAN AREAS IN THE INKOMATI TO USUTHU WMA AND QUATERNARY CATCHMENT W53A; LOCATED WITHIN AND A 500M BUFFER AROUND THE PROPOSED RAIL ALIGNMENT.

Watercourse Type*	Watercourse Number	Calculated PES Class	Adjusted PES Class	Level of confidence	EIS Class	Level of confidence
Riparian Stream	1	C	D/E	Moderate	Moderate/ Low	Moderate/ High
Riparian Stream	2	B	C	Moderate	High	Moderate
Riparian Stream	3	C	D/E	Moderate	Moderate/ Low	Moderate/ High
Riparian Stream	4	B	C	Low	High	Moderate
Channelled valley bottom wetland	5	C	Same	Moderate	Moderate	Moderate
Seep wetland	6	D	Same	Moderate	Moderate/ High	High
Seep wetland	7	C	Same	Moderate	High	Moderate
Seep wetland	8	B	Same	High	High	High
Seep wetland	9	C	Same	Moderate	High	Moderate
*Two unlabelled riparian streams located upstream of	N/A	A/B	Same	Moderate	High	Moderate

the eastern-most dam						
*Unlabelled riparian stream located downstream of the eastern-most dam	N/A	D/E	E	Moderate	Moderate/ Low	Moderate

Riparian Streams

Four riparian streams are present within the study area, all within the Inkomati - Usuthu WMA. Riparian streams no. 1, 2 and 4 are headwater systems on steep slopes that are crossed by an existing railway line, while Riparian stream no. 3 is crossed by an existing dirt road. All four of these watercourses are therefore impacted systems, but their ecological condition varies. Each of the riparian streams form tributaries of the Sandspruit and drain into the river approximately 8.4 km east of the eastern tunnel portal. Riparian streams no. 1 and 3 are encroached by dense stands of *Acacia dealbata* and *A. mearnsii*. Both of these watercourses are fed by headwater wetlands, while Riparian stream 1 forms a tributary of Riparian stream no. 3. Riparian stream no. 1 receives inter-basin water flow from the Upper Vaal WMA via the existing tunnel system, which is sloped to the east from the western portal. Surface water that is intercepted at the western tunnel portal and groundwater ingress into the tunnel, are transported in channels adjacent to the railway line and directed into Riparian stream no.1 via stormwater outlets located upstream and downstream of the existing rail crossing. Apart from the presence of encroached exotic wattles and dirt roads in Riparian stream no. 3, other impacts include channel scour and incision, as well as the presence of a large dam at the downstream end of the delineated watercourse. This dam is believed to have been created from spoil material from the construction of the existing tunnel. The input of water that is expected to have a below-average quality and the dense stands of alien trees have let to adjustment of the calculated scores for Riparian streams no. 1 and 3, which are regarded to have a Largely to Seriously modified PES (Class D/E).

Riparian streams no. 2 & 4 are in a more natural condition compared to the other two riparian systems and are also expected to have some wetland habitat associated with them. Their functionality is however regarded to be more consistent with that of a riparian watercourses, even though riparian systems often lack trees in the grassland biome as is the case with these two watercourses. They are not encroached by exotic wattles and contain few other alien species based on available information. Both of the watercourses are however impacted by an existing railway crossing with infilling and culverts. Flow modification have therefore occurred in the downstream sections of both watercourses. Based on these impacts in close proximity to the proposed infrastructure development the PES classes of the watercourse have been adjusted and are regarded as Moderately modified (Class C).

The original calculated PES classes for the four assessed riparian streams were adjusted as the calculated scores were considered to be too high due to a strong emphasis on flow characteristics and less emphasis on habitat features in the applied PES method. As a result, the presence of extensive stands of invasive alien wattle species were given more prominence as part of the adjustment process.

The scores were further reduced to reflect conditions at proposed development footprints, which include areas along existing rail line crossings.

All of the riparian streams overlap partially with a Critical Biodiversity Area, as indicated on the 2013 Mpumalanga Biodiversity Sector Plan (MBSP 2013). The EIS of Riparian stream no. 1 and 3 are regarded as Moderate to Low due to the magnitude of existing impacts, while Riparian streams no. 2 and 4 are regarded as High. **Figure 18**, illustrates impacts in Riparian streams no. 1 and 3, such as inter-basin water transfer through the existing tunnel from the Upper Vaal WMA (top row left and right); The existing railway line crossing through Riparian stream 1 and the release of inter-basin transferred water at stormwater outlets upstream (second row) and downstream (third row) of the rail crossing; & Riparian stream no. 3 with *Acacia dealbata* and *A. mearnsii*, as well as a dirt road (bottom row). Figure 11: Illustrates Riparian stream no. 2, upstream (left) and downstream (right) of the existing rail line crossing, which includes its confluence with Riparian stream no. 3 (right).

FIGURE 18: RIPARIAN STREAMS (INKOMATI - USUTHU WMA).

FIGURE 19: RIPARIAN STREAMS CONTINUED (INKOMATI – USUTHU WMA).

Channelled valley bottom wetlands

Only a single Channelled valley bottom wetland (no. 5) is present within the Inkomati – Usuthu WMA. The wetland contains signs of channel scour, which is to be expected on a steep slope, but the watercourse is also impacted by an upstream dam and stands of exotic wattles (*Acacia dealbata* & *A. mearnsii*). The watercourse drains into Riparian stream no. 1 and is fed by seepage wetlands. The channelled valley bottom wetlands overlap with an Optimal Critical Biodiversity Area, as indicated on the 2013 Mpumalanga Biodiversity Sector Plan (MBSP 2013). The PES of the watercourse is regarded as Moderately modified (Class C), but is likely to decrease further over time due to continued encroachment of the invasive alien plants, specifically wattle species. The EIS of the wetland is regarded as Moderate.

FIGURE 20: CHANNELLED VALLEY BOTTOM WETLAND NO. 5.

Seep Wetlands

Four seep wetlands are present within the Inkomati - Usuthu WMA; Seeps no. 6–9, all of which are significant smaller compared to the high number of extensive seep wetlands present within the Upper Vaal WMA. Impacts include the presence of a dam (Seep wetland no. 6), encroachment of *Acacia dealbata* & *A. mearnsii* (Seep wetland no. 6, 7 & 9) and historic cultivation practices that have led to gully erosion (Seep wetland no. 9).

Only Seep wetland no. 9 overlaps partially with a Threatened Ecosystem area, according to the 2011 Schedule (Government Gazette of December 2011 and GNR 1002 of 09 December 2012) of the Biodiversity Act (Act 10 of 2004), namely Eastern Highveld Grassland (GM12), which has a Vulnerable status. All of the seep wetlands overlap partially with an Optimal Critical Biodiversity Area, as indicated on the 2013 Mpumalanga Biodiversity Sector Plan (MBSP 2013).

Seep wetland no. 8 is in the best overall ecological condition (PES class B); followed by Seep wetlands no. 7 & 8 (PES class C) and Seep wetland no. 6 (PES class D). The EIS classes follow a similar pattern and range from High (Seep wetland no. 7–9) to Moderate/ High (Seep wetlands no 6).

FIGURE 21: SEEP WETLAND NO 8.

5.1.5.2.2. WETLAND WATERCOURSES IN THE UPPER VAAL WMA

The PES scores of assessed watercourses range between '**Pristine' (Class A) to 'Seriously/ Critically modified' (Class E/F)**, while EIS values for the same wetlands and riparian areas range between **Very High** and **Moderate/ Low** (**Table 13**).

TABLE 13: DETERMINED PES AND EIS SCORES FOR DELINEATED WATERCOURSES IN THE UPPER VAAL WATER MANAGEMENT AREA (WMA) AND QUATERNARY CATCHMENT C11B; LOCATED WITHIN A 500M BUFFER AROUND THE PROPOSED RAIL ALIGNMENT.

Watercourse Type*	Watercourse Number	Calculated PES Class	Adjusted PES Class	Level of confidence	EIS Class	Level of confidence
Seep wetland	10	B	B	High	Very High	High
Unchannelled valley bottom wetland	11	B	B/C	High	Very High	High
Seep wetland	12	A	A/B	High	Very High	High
Unchannelled valley bottom wetland	13a (section upstream of rail crossing)	B	C	High	High	Moderate
Unchannelled valley bottom wetland	13b (section downstream of rail crossing	F	E	High	High/ Moderate	Moderate
Seep wetland	14	B	B/C	Moderate	High	Moderate
Seep wetland	15	F	E/F	Moderate	Moderate	Moderate
Unchannelled valley bottom wetland	16	E	Same	Moderate	Very high	High
Seep wetland	17	C	Same	Moderate	High	Moderate
Channelled valley bottom wetland	18	D	Same	Moderate	High	Moderate

Seep wetlands

Five seep wetlands are present within the study area that range in size from 3.03 ha (Seep no. 17) to 126.87 ha (Seep no. 15). All of the identified seeps, apart from Seep no. 14, extend beyond the 500 m buffer and they range in PES from Pristine/ Largely natural (Seep wetland no. 12) to Seriously/ Critically modified.

Seep wetlands no. 10, 12 and 14 are in a more natural condition compared to other seeps within the Upper Vaal WMA, with no prominent catchment impacts and no exotic wattle species, while only a few alien species are present that include localised patches of *Campuloclinium macrocephalum* (Pom pom weed). No erosion features were identified in any of the three seeps. Minor impacts are present in the form of mowing and baling of indigenous grasses, while the most notable impact is associated with a dirt road crossing. Dewatering and associated desiccation impacts associated with the existing tunnel that underlies all three of these seeps remain unknown, but all of three of the seep wetlands remain in a well functioning condition with several springs located near their upper margins, particularly in Seep wetland no. 10 and 12. The EIS range from High to Very High due to the presence of a high indigenous plant diversity, different habitat types, unique features such as high-lying springs, large stands of three to four orchid species (De Frey, 2015), and complete overlap with an Irreplaceable Critical Biodiversity Area (MBSP 2013). In addition, all three seeps also overlap entirely with a Threatened Ecosystem area, according to the 2011 Schedule (Government Gazette of December 2011) of the Biodiversity Act (Act 10 of 2004), namely Chrissiesmeer Panveld (MP3), which has an Endangered status.

Seep wetland no. 17 has a Moderately modified PES, mainly due to the presence of historic cultivation (old lands) and planted pastures. The EIS is regarded as High due to overlap with a Threatened Ecosystem (Chrissiesmeer Panveld).

Seep wetland no. 15 represents a watercourse that has a Seriously/ Critically modified PES. The wetland can be divided into two halves, separated by the entrenched railway line. The section located upslope (south) of the railway line is fragmented by a dirt road, infilling (e.g. berms along the railway line), vehicle tracks, silos, planted pastures, cultivated maize and only a small section of remaining untransformed wetland habitat along the eastern boundary of the seep. This upslope half of the seep is in a slightly better condition compared to the downslope (southern) half. The latter is severely desiccated as a result of the entrenched railway line that functions as a deep cut-off drain, which is an irreversible impact. This has enabled the cultivation of maize in the majority of the downslope portion of the seep, which still contains widespread signs of hydromorphic features associated with seasonal and permanent wetness zones, indicative of conditions prior to the construction of the railway line. The EIS of the wetland is regarded as Moderate due to the magnitude of habitat transformation and only small remaining sections of untransformed habitat that overlap with a Threatened Ecosystem (Chrissiesmeer Panveld). **FIGURE 22**, illustrates large areas of seep wetland habitat that have a high plant species diversity and contain very few alien species (top left); Dense stands of orchid species were common in February in selected seep wetlands, such as Seep wetland no. 10 and 12 (top right); Localised springs located near the upper margin of seep wetlands were common throughout the study area, particularly in untransformed and largely natural seeps (bottom left); Indigenous vegetation, and not planted pastures, were cut and baled during May in Seep wetland no. 10, this represents a sustainable land use that has minimal negative impact on untransformed seeps (bottom right). FIGURE 23, illustrates different portions of Seep wetland no. 15, such as a planted pasture south of the silos (top row); Remaining wetland patches in between rail and road infrastructure north of the silos (second row); The entrenched railway line that functions effectively as a deep cut-off drain (third row); & Cultivated maize in the desiccated wetland section downslope of the entrenched railway line (bottom row).

FIGURE 22: ABOVE PICTURES ARE REPRESENTATIVE VIEWS OF THE SEEPAGE WETLAND (UPPER VAAL WMA).

FIGURE 23: ABOVE PICTURES ARE REPRESENTATIVE VIEWS OF THE SEEPAGE WETLAND 15.

Unchannelled valley bottom wetlands

The three unchannelled valley bottom wetlands present in the Upper Vaal WMA range in size from 7.75 ha to 37.98 ha, while the PES range from Largely natural/Moderately modified to Seriously modified.

Unchannelled valley bottom 11 has a Largely natural/Moderately modified PES. Its eastern section is in a near pristine condition, but a series of road and powerline tower crossings reduces its ecological health. The EIS of the wetland is regarded as Very high, as large portion of unimpacted wetland habitat remain present and overlap occurs with an Irreplaceable Critical Biodiversity Area (MBSP 2013) and a Threatened Ecosystem (Chrissiesmeer Panveld).

Unchannelled valley bottom 13 can be divided into two halves: The section upstream (south) of the railway line crossing, which has a higher ecological health (class C PES), with the most prominent impacts being the presence of a large berm and cut-off drain parallel to the railway line. The berm and cut-off drain intercept surface and inter flow in the wetland before it reaches the western tunnel portal and the entrenched railway line, in order to reduce flooding in the tunnel and water discharge into the Usutu to Mhlatuze WMA.

The cut-off channel is extended across the tunnel and becomes a diversion channel that bypassed the downstream (northern) half of the unchannelled valley bottom wetland completely, as it transports all of the intercepted water to a single discharge points west of the wetland, in Seep wetland no. 15 . The downstream portion of the wetland is therefore Seriously modified (class E PES), as a result of severe desiccation with all of its upstream flow being diverted into another wetland. The EIS of the wetland can be regarded High/moderate, as natural wetland habitat remain present and overlap occurs with an Irreplaceable Critical Biodiversity Area (MBSP 2013) and a Threatened Ecosystem (Chrissiesmeer Panveld).

Unchannelled valley bottom 16 is associated with the Sterkspruit drainage line indicated on topographical map 2630 CA. The wetland has a Seriously modified (class E) PES, which mainly reflects the condition of the wetland section that overlap with the existing dirt road and railway lines. The upstream portion of the wetland as a higher ecological health and also contain a stand of species of conservation concern next to the dirt road namely, *Gunnera perpensa*, which has a Declining IUCN conservation status category. The presence of this species and overlap with an Irreplaceable Critical Biodiversity Area (MBSP 2013) and a Threatened Ecosystem (Chrissiesmeer Panveld), gives the wetland a Very high EIS. **FIGURE 24**, illustrates Unchannelled valley bottom no. 11 and 16. Unchannelled valley bottom wetland no. 11 is in a pristine condition at it origin (centre row); downstream impacts include road crossings, such as the access road to Mr. Van der Meulen's residence (top left). Unchannelled valley bottom wetland no. 16 contains dams and is impacted by infill associated with the construction of the existing rail way lines (bottom row); Species of conservation concern, such as the Declining *Gunnera perpensa*, are present within Unchannelled valley bottom no. 16 (top right).

FIGURE 25, illustrates different portions of Unchannelled valley bottom no. 13. These include the large berm west of the western tunnel portal in the upstream portion of the wetland, south of the railway line, and a parallel cut-off channel located in from of the berm that intercepts surface and inter flow within the upstream wetland section (top and centre rows); and the downstream wetland section is desiccated as the cut-off drain changes into a flow diversion channel that directs water away from the northern portion of the unchannelled valley bottom wetland and releases it west of the wetland (bottom row).

FIGURE 24: UNCHANNELED VALLEY BOTTOM WETLAND 11 & 16.

FIGURE 25: ABOVE PICTURES ARE REPRESENTATIVE VIEWS OF THE UNCHANNELED VALLEY BOTTOM WETLAND 13.

Channelled valley bottom wetland

Only a single channelled valley bottom wetland is present within the Overvaal portion of the study area and is also associated with the Sterktspruit drainage line indicated on topographical map 2630CA. Unchannelled valley bottom wetland no. 11 and no. 16 forms a confluence immediately downstream of existing railway line crossings through a narrow culvert, which results in the formation of Channelled valley bottom wetland no. 18. The wetland has a Largely modified (class D) PES and is impacted by a series of infilled areas that were used as spoil sites during the construction of the existing tunnel in the 1970s. The EIS of the wetland is High as natural habitat remains present, while the watercourse also overlaps with an Irreplaceable Critical Biodiversity Area (MBSP 2013) and a Threatened Ecosystem (Chrissiesmeer Panveld). **Figure 26**, illustrates Channelled valley bottom wetland no.18 at the confluence with Unchannelled valley bottom no. 11 and no. 16.

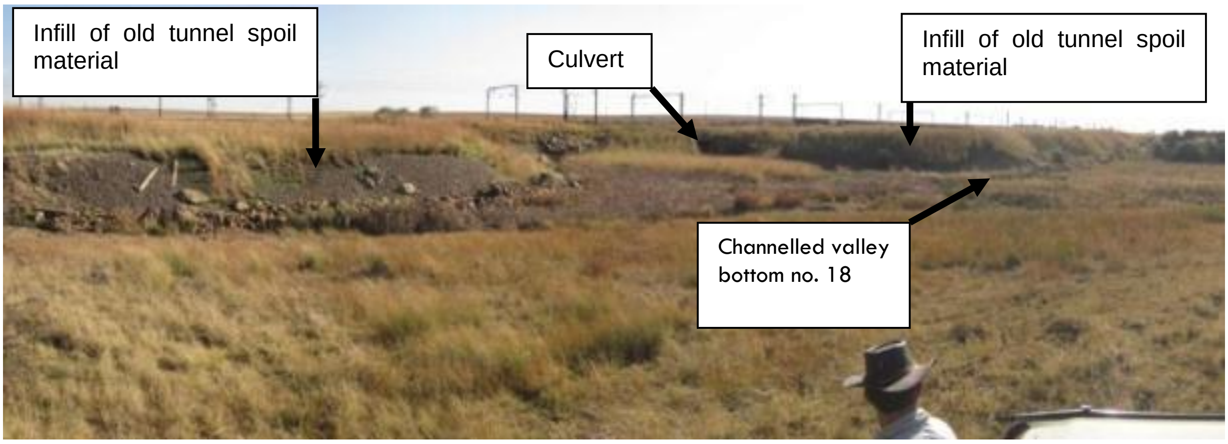

FIGURE 26: CHANNELED VALLEY BOTTOM WETLAND 18.

5.1.6. HYDROGEOLOGY (GROUNDWATER)

A hydrogeological specialist investigation and report has been undertaken for this EIA. A summarised description of the nature of the receiving environment is presented herein- please refer to the full specialist report for further details (Appendix G).

Based on the groundwater level data, the general groundwater flow direction is from the west (Highveld Plateau) towards the east. Two types of aquifers exist underlying the project area namely:

- Shallow unconfined weathered aquifer, within the Quaternary sediments, weathered Karoo and Dolerite formations; and
- Deeper confined to semi-confined fractured bedrock aquifer, within the fresh but fractured Karoo and Dolerite bedrock.

The groundwater levels support that these two aquifers are mainly independent from each other, but connectivity might exist near the existing tunnel portal areas due to the drill and blasting method used to construct the existing tunnel.

In total, six groundwater samples were collected for chemical analysis. These results revealed that the general groundwater quality of the weathered aquifer falls within the ranges recommended by the South African National Standard (SANS 241:2011) except for the elevated manganese and iron concentrations. The groundwater quality of the deeper fractured bedrock aquifer falls completely within the ranges recommended by the SANS and is suitable for human consumption.

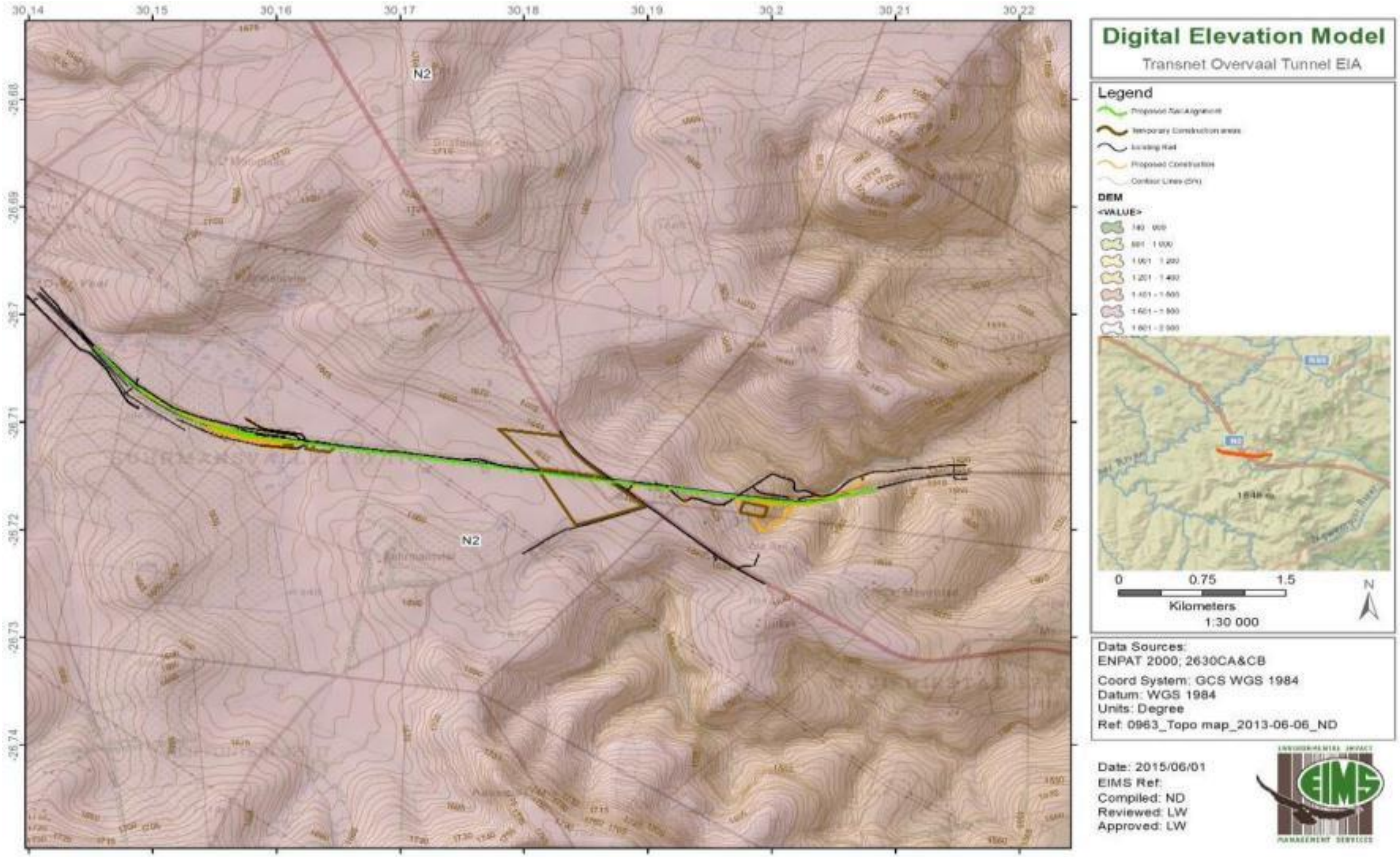

FIGURE 27: TOPOGRAPHY OF THE PROPOSED PROJECT SITE.

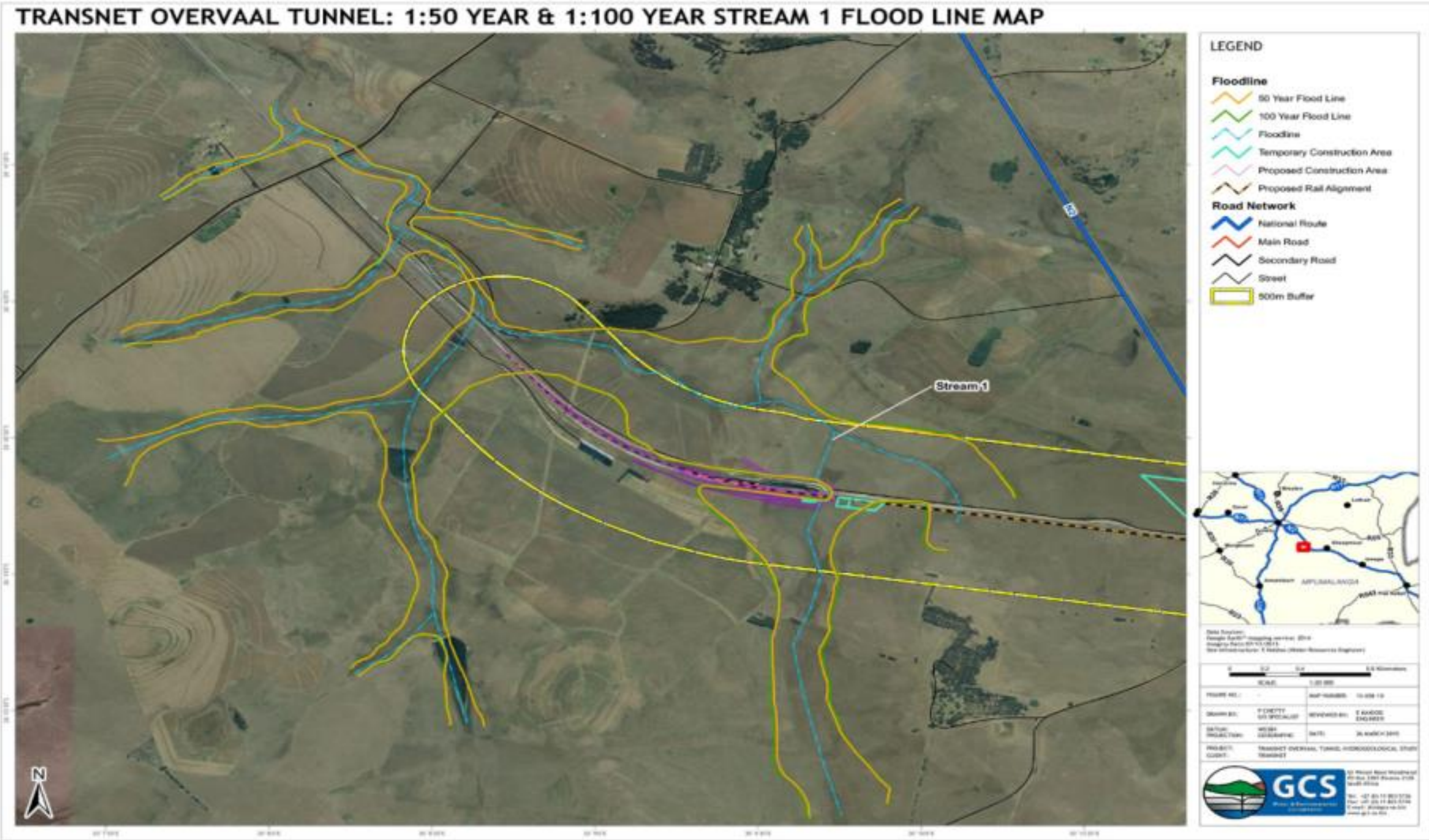

FIGURE 28: EXTENT OF THE 1:50-YEAR AND 1:100-YEAR FLOOD LINES FOR STREAM 1 OF THE PROPOSED PROJECT (GCS; 2015).

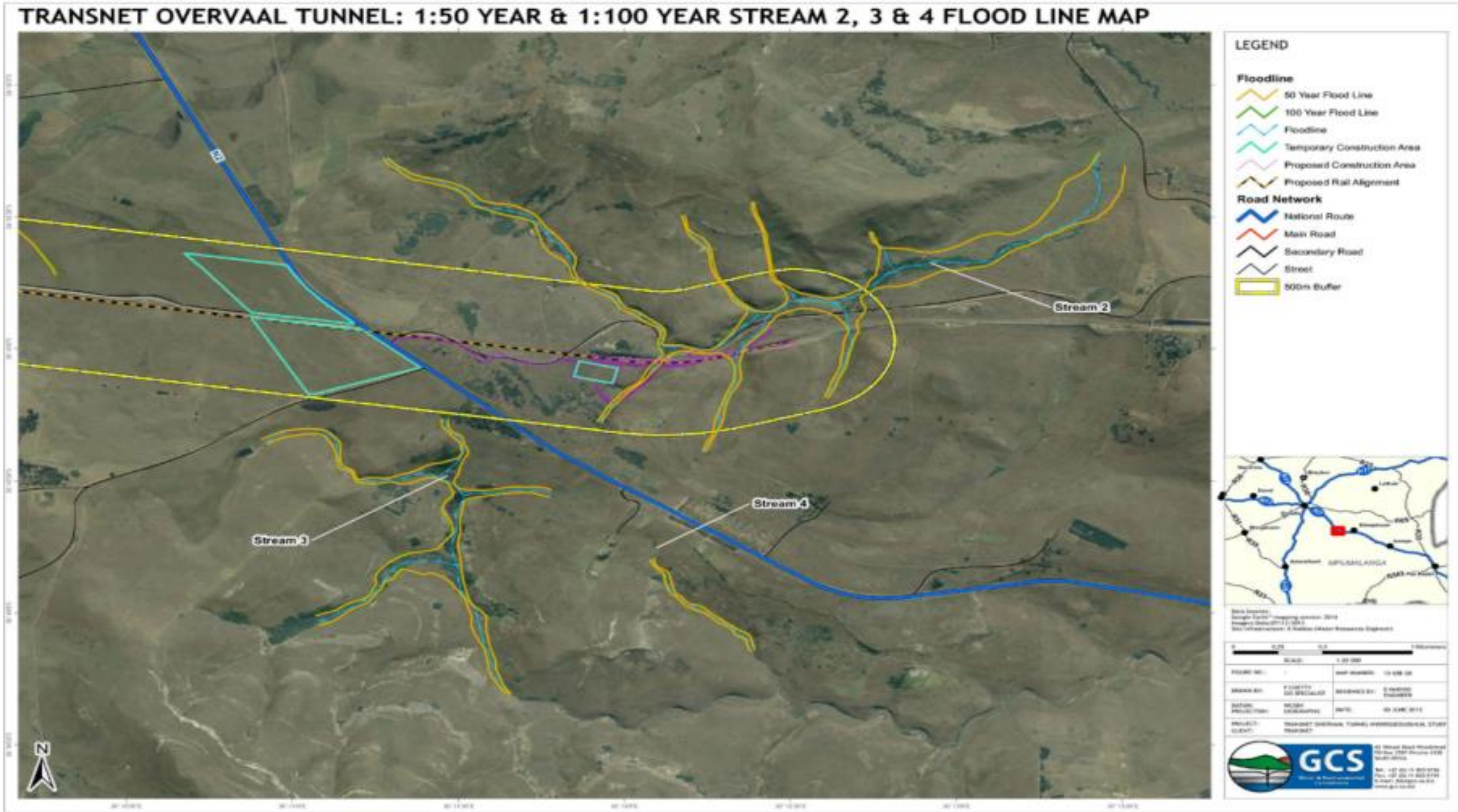

FIGURE 29: EXTENT OF THE 1:50-YEAR AND 1:100-YEAR FLOOD LINES FOR STREAM 2, STREAM 3 AND STREAM 4 OF THE PROPOSED PROJECT (GCS; 2015).

5.2. Land use and land cover

This section provides a brief description of the land cover and land use dominant within the vicinity (regional and local) of the proposed project site.

5.2.1. RESIDENTIAL

Msukaligwa Local Municipality (MLM) is one of seven (7 local) municipalities under the jurisdiction of the Gert Sibande District Municipality (GSDM). Please refer to section 5.5 for the planning and development policies relevant to GSDM. MLM is situated in the southern part of Mpumalanga. Its western boundary is approximately 150km east of Gauteng and its eastern boundary is approximately 8km west of the Swaziland border and is surrounded by the following local municipalities:

- Albert Luthuli and Steve Tshwete to the northeast and north;
- Govan Mbeki to the west;
- Lekwa to the southwest;
- Pixley ka Seme to the south; and
- Mkhondo to the southeast.

MLM is approximately 830 957 ha in extent and comprises 13% of the Gert Sibande District Municipality in Mpumalanga Province with the estimated population of 124 319.

The proposed project site is situated approximately 15 km towards the west of Sheepmoor settlement. The Sheepmoor settlement is mainly residential and, other than surrounding agricultural activities, there is no local economic base. Few residential houses and AFGRI storage facilities (please refer to Figure 30) exist within close proximity to the proposed project, towards the eastern tunnel exit. Majority of the landowners are small-scale livestock farmers and utilize the area for dry land crop cultivation. It is important that selection of the proposed project associated activities (e.g. lay down areas and construction camp) site takes the location of the existing houses within the farm into consideration. With reference to Figure 31, it is understood that only one homestead will be impacted by the current proposed project servitude. It is therefore recommended that, any damage to public or private property, be repaired, replaced or otherwise compensated for as agreed to with the affected party.

FIGURE 30: VIEW OF AFGRI STORAGE FACILITIES AND THE RICHARDS BAY COAL LINE SECTION TOWARDS THE NORTH OF THE PROPOSED PROJECT SITE.

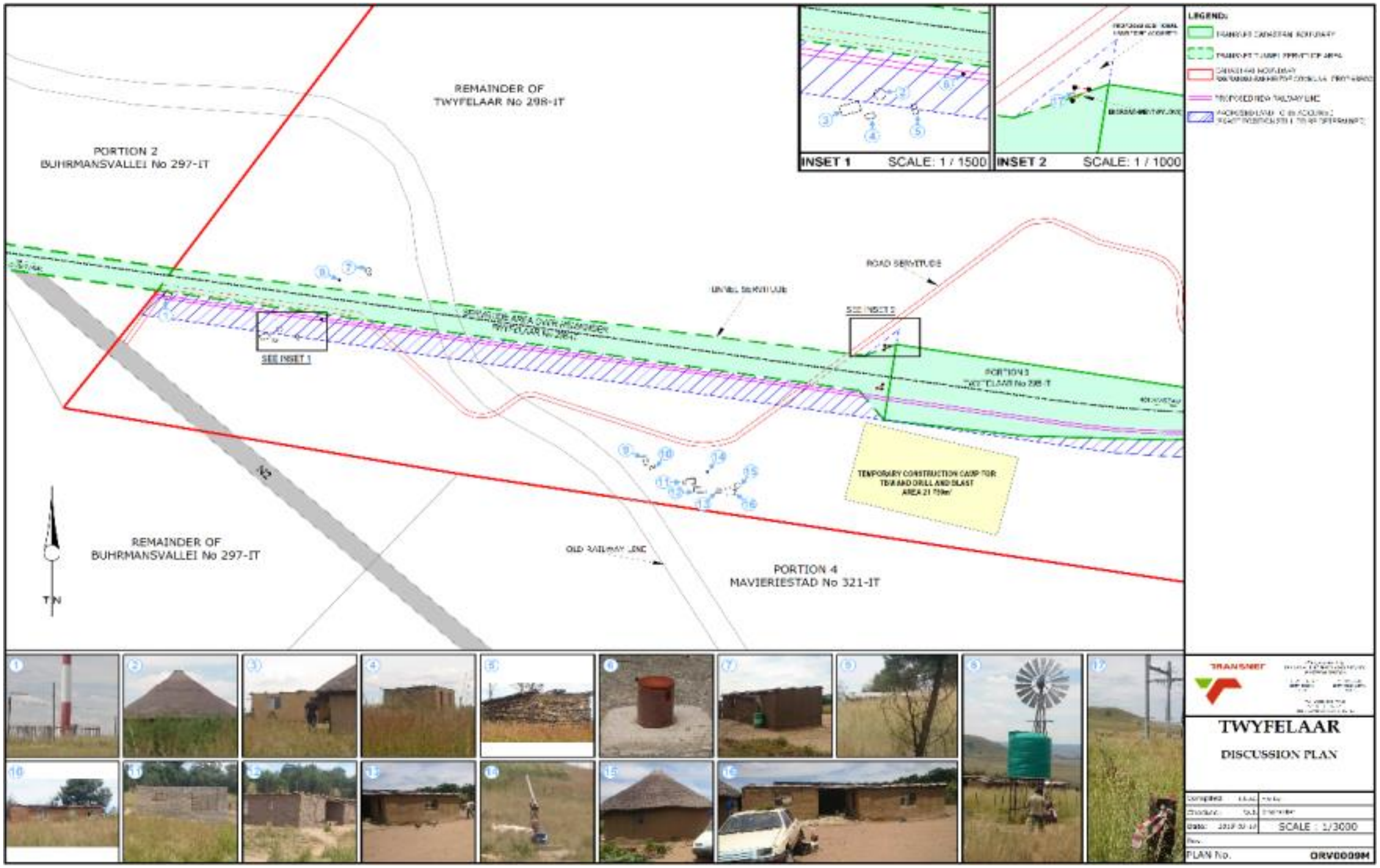

FIGURE 31: DISCUSSION PLAN SHOWING HOMESTEAD WITHIN PROPOSED SERVITUDE.

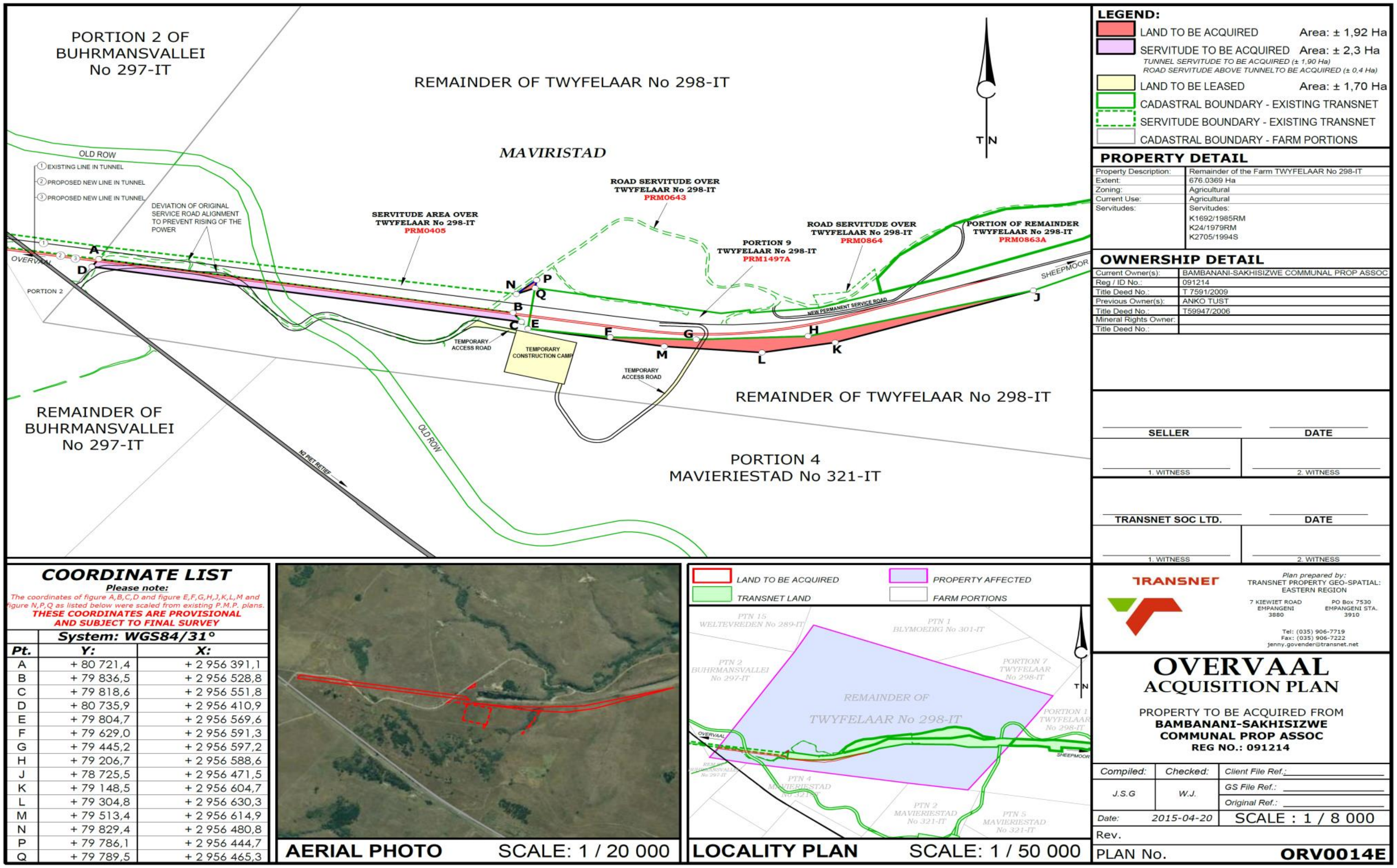

FIGURE 32: VIEW OF TRANSNET LAND ACQUISITION MAP

5.2.2. AGRICULTURE AND FARMING

The land uses surrounding the existing tunnel and proposed project includes primarily agricultural lands. The section along which the proposed project is located is currently used for grazing and cultivation, (please refer to Figure 33). Vast areas within and around the proposed project site are currently being utilized for dry land crop cultivation. Agriculture accounted for about 4.7% of the Gross Value Added by Region (GVA-R) but its significance lies in its share of employment, which was roughly 17.6% in 2007. (Msukaligwa Spatial Development Framework, 2010).

The area has very productive agricultural land with an average rainfall of 750 mm per annum, (Msukaligwa Spatial Development Framework, 2010). The general land use within the broader vicinity of the proposed project is seasonal cultivation of maize, soya bean, and livestock rearing (mainly sheep and cattle). Based on observations during the site visits, it is understood that the directly adjacent properties undertake a mixture of livestock grazing and cultivation (primarily maize).

5.2.3. MINING

The regional area is also characterised by coal mining activities, however no coal mining activities are present within the vicinity of the proposed project. Mining industry is very active in the region with coal being the primary product/mineral being mined, typically through open cast mining. Coal mining has been an important sector in the local economy for many years. Increased international and local (Eskom) demand for coal has provided a huge impetus to the South African coal mining industry and MLM is no exception. Plans are in the pipeline for a number of new coal mines in the vicinity of Ermelo and these will have a significant positive impact on the local economy, not only directly through the creation of more jobs, but also indirectly through the stimulation of other economic sectors such as transport, construction, etc. (Msukaligwa Spatial Development Framework, 2010).

5.2.4. TOURISM

The Chrissiesmeer lakes district is situated approximately 35km north of the proposed project site. The area incorporates some unique and very beautiful landscapes somewhat reminiscent of the Scottish highlands and offers world-class bird watching opportunities.

The N2 national road crosses over the proposed project route and is anticipated to be a route travelled by local tourist traffic (please refer to Figure 33). Overvaal Guesthouse is situated approximately 2 km towards the north west of the proposed project.

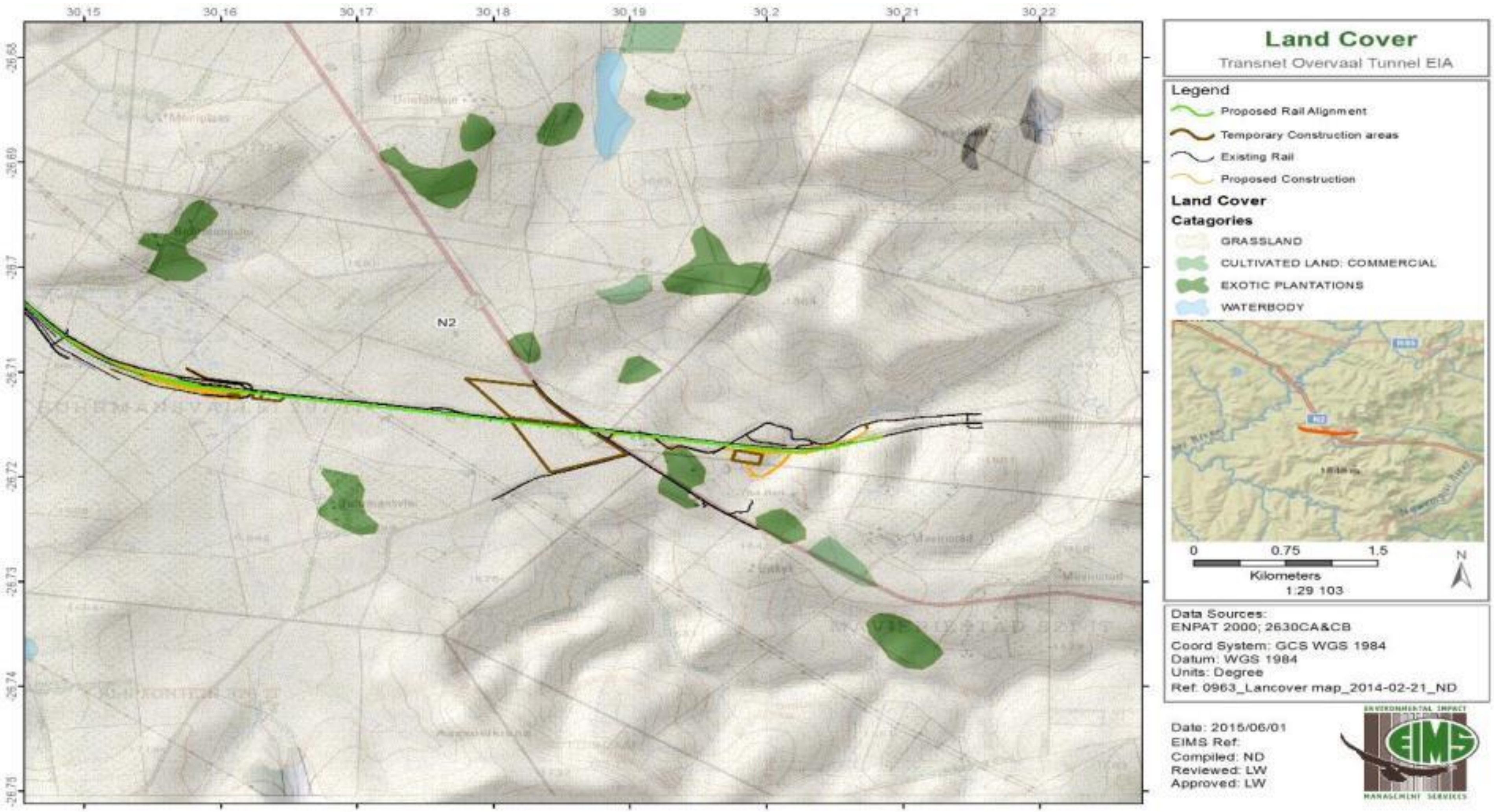

FIGURE 33: LAND COVER WITHIN AND AROUND THE STUDY AREA

5.2.5. BIODIVERSITY AND CONSERVATION AREAS

In terms of uniqueness, Mpumalanga's most important aspects are its diversity of grassland habitats, center of grassland species diversity (refer to **Figure 34**) and the strong ecological gradient role the Escarpment plays with respect to fauna and flora diversity (Mpumalanga Province, 1999). The GSDM is certainly no exception, and is home to several areas of high biodiversity and six centers of endemism (the only area where a certain species or species exist), namely Barberton, Badplaas, Chrissiesmeer, and the three Wakkerstroom areas. Consequently, the District plays host to a number of regionally significant ecological corridors and important conservation, biodiversity and environmental heritage areas – as identified by the Mpumalanga Biodiversity Conservation Plan (2006) and the Mpumalanga Integrated Spatial Framework.

Notably, although environmentally sensitive areas are found throughout the District due to the grassland nature of the municipal landscape, areas of "irreplaceable" and "highly significant" biodiversity are concentrated along the north – south alignment followed by the Escarpment.

The following conservation areas are situated within the MLM:

- The Holkranse natural heritage area is situated on the N17 midway between Ermelo and Chrissiesmeer (approximately 40 km to the north of the proposed project).
- The Morgenstond Dam Nature Reserve straddles the south eastern boundary of the municipality (approximately 35 km to the east of the proposed project).
- The Jericho Dam Nature Reserve conserves grasslands areas around the dam, which is situated in the south eastern part of the municipality (approximately 30 km to the east of the proposed project).
- The Nu Scotland Conservancy is situated on Provincial Road R65 in the eastern part of the municipality south of the Chrissiesmeer panveld and northwest of the Jericho Dam (approximately 30 km to the east of the proposed project).
- The Rietvaal Conservancy straddles the south western boundary of the municipality along the Vaal River, and is characterized by extensive floodplain wetlands (approximately 20 km to the west of the proposed project).

It is anticipated that all of the above-mentioned conservation areas will fall outside of the zone of influence of the proposed project.

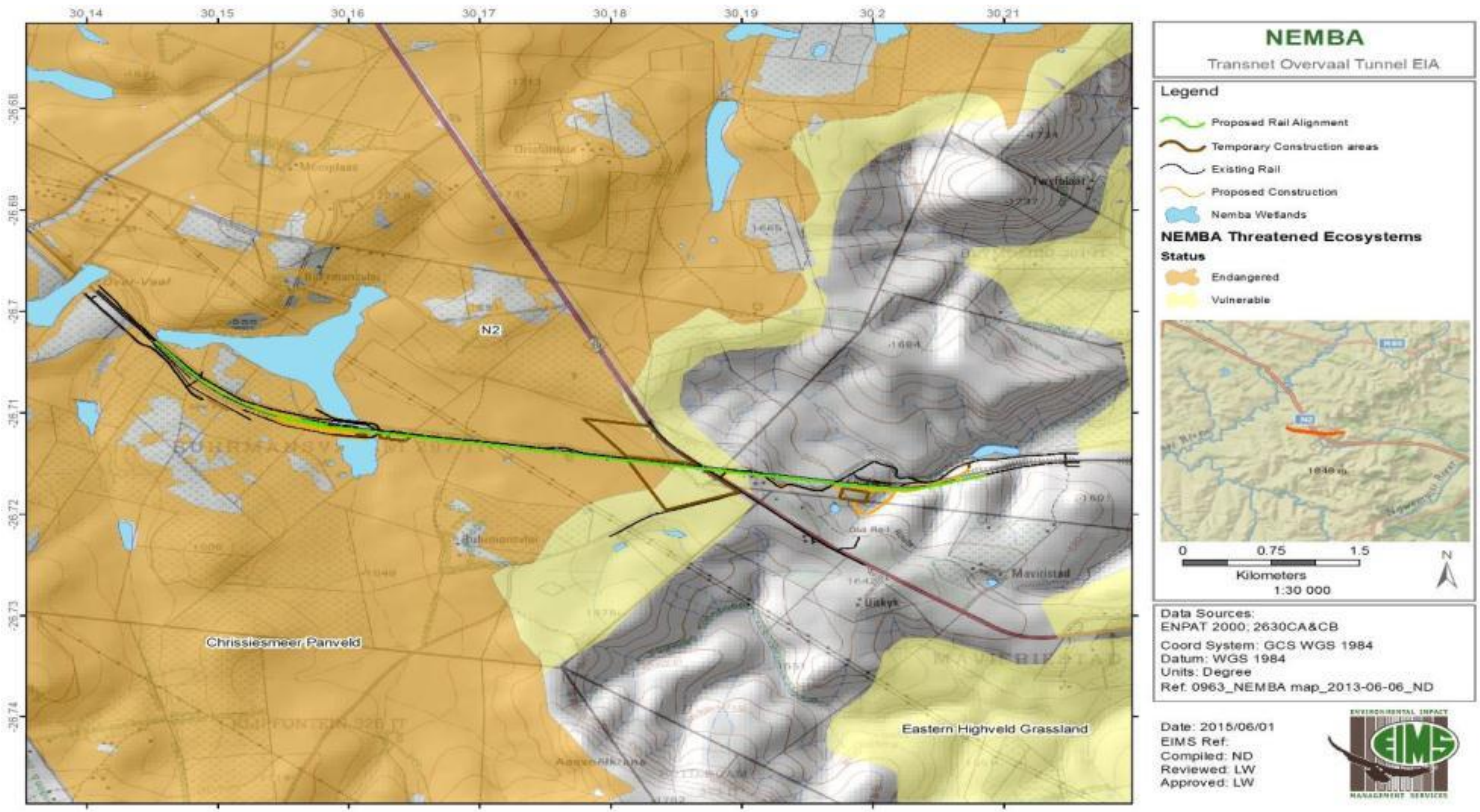

FIGURE 34: NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT THREATENED ECOSYSTEM

5.3. Biological Environment

5.3.1. FLORA

A specialist ecological assessment has been undertaken for the project. This section presents relevant extracts from this study. Please refer to Appendix F for the full report and supporting information.

5.3.1.1. ECOSYSTEM DIVERSITY

5.3.1.1.1. REGIONAL CONTEXT

On a regional scale, the study area transects two regional vegetation units (refer to **Figure 35**), namely:

1. Eastern Highveld Grassland (Endangered); and
2. Wakkerstroom Montane Grassland (Least Threatened).

The endangered Eastern Highveld Grassland dominates the area to the west of the N2 freeway, while the least concern Wakkerstroom Montane Grassland dominates the area to the east of the N2 freeway.

TABLE 14: DESCRIPTION OF REGIONAL VEGETATION UNITS (DE FREY; 2015).

Vegetation unit	Description (Mucina & Rutherford; 2006).
Eastern Highveld Grassland	This regional vegetation unit occurs on: “Slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual Highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya* etc.) with small scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra, Celtis africana, Diospyros lyciodes subsp lyciodes, Parinari capensis, Protea caffra, P. welwitschii and Rhus magalismontanum*).” The Eastern Highveld Grassland regional vegetation unit is classified as Endangered, with a conservation target of 24%, only a very small fraction is conserved in statutory reserves and private reserves. Cultivation, plantations, mines, urbanisation and building of dams has transformed approximately 44% of this vegetation unit. Cultivation may have had a more extensive impact. No serious alien invasions are reported, but *Acacia mearnsii* can become dominate in disturbed sites. Erosion is very low.

Wakkerstroom Montane Grassland	This regional vegetation unit occurs on: "This unit is a less obvious continuation of the Escarpment that links the southern and northern Drakensberg escarpments. It straddles this divide and is comprised of low mountains and undulating plains. The vegetation comprises predominately short montane grasslands on the plateaus and the relatively flat areas, with short forest and *Leucosidea* thickets occurring along steep, mainly east facing slopes and drainage areas. *L. sericea* is the dominant woody pioneer species that invades areas as a result of grazing mismanagement." Wakkerstroom Montane Grassland is classified as least threatened, its conservation target is 27%, less than 1% is statutorily protected in the Paardeplaats Nature Reserve. There are 10 South African Natural Heritage Sites in this unit, although very little is formally protected. Land use pressures from agriculture is low (5% cultivated), probably owing to the colder climate and shallower soils. The area is also suited to afforestation, with more than 1% under *Acacia mearnsii* and Ecualyptus plantations. The black wattle (*Acacia mearnsii*) is an aggressive invader of riparian areas. Erosion very low (78%) and low (19%).

On a larger scale (landscape level), the Overvaal tunnel is located within the South-eastern Mpumalanga Plains Vegetation Type, more specifically within the following communities and sub-communities based on 18 plots located within 10 km of the study area:

- *Vernonia natalensis - Themeda triandra* pure low closed grassland community
- *Crabbea acaulis - Vernonia natalensis* low// short sparse shrubland sub-community
- *Microchloa caffra - Vernonia natalensis* pure low closed grassland sub-community
- *Cucumis zeyheri - Hyparrhenia hirta* low// short sparse shrubland community
- *Helichrysum cephaloideum - Cucumis zeyheri* low// short thicket sub-community
- *Cephalanthus natalensis - Cucumis zeyheri* low// short sparse shrubland sub-community

The 18 plots contained 115 species of which the following species were recorded in more than 50% of the plots: *Acalypha angustata, Anthospermum rigidum, Berkheya setifera, Crepis hypochoeridea, Eragrostis capensis, Eragrostis curvula, Eragrostis plana, Eragrostis racemosa, Haplocarpha scaposa, Helichrysum rugulosum, Heteropogon contortus, Hypochoeris radicata, Hypoxis iridifolia, Setaria sphacelata, Themeda triandra, Tristachya leucothrix, Vernonia natalensis*.

From the available literature it is evident that the study area is located on a transitional zone on both a regional scale (vegetation units) and landscape scale (vegetation communities). It is expected that the results from the local/ on-site scale will reflect this trend.

While biomes and bioregions are valuable as they describe broad ecological patterns, they provide limited information on the actual species that are expected to be found in an area. Knowing which vegetation type an area belongs to provides an indication of the floral composition that would be found if the proposed project site was in a pristine condition, which can then be compared to the observed floral list and so give an accurate and timely description of the ecological integrity of the proposed project site.

5.3.1.1.2. LOCAL CONTEXT

During the vegetation survey completed from the 18th of February to the 20th of February 2015, 15 plots were sampled. Two vegetation communities and four sub communities were identified as follows (**Figure 36**):

- Hyparrhenia hirta - Eragrostis curvula tall disturbed grassland on well-drained, medium textured, moderate deep soils associated with medium slopes:
  - Helichrysum nudifolium - Hyparrhenia hirta - Eragrostis curvula tall disturbed grassland
  - Helichrysum rugulosum - Hyparrhenia hirta - Eragrostis curvula tall disturbed grassland

- Helichrysum aureonitens - Eragrostis plana tall climax grassland on moist, coarse textured, deep soils associated with flat slopes:
  - Satyrium longicauda - Helichrysum aureonitens - Eragrostis plana tall climax grassland
  - Arundinella nepalensis - Helichrysum aureonitens - Eragrostis plana tall climax grassland.

Based on the available analysis it is concluded that the main environmental factors which influence the distribution and extent of these two vegetation communities and four sub communities are:

1. Altitude.
2. Slope.
3. Soil properties – texture and depth.

Of which the soil properties appear to be the most critical factors.

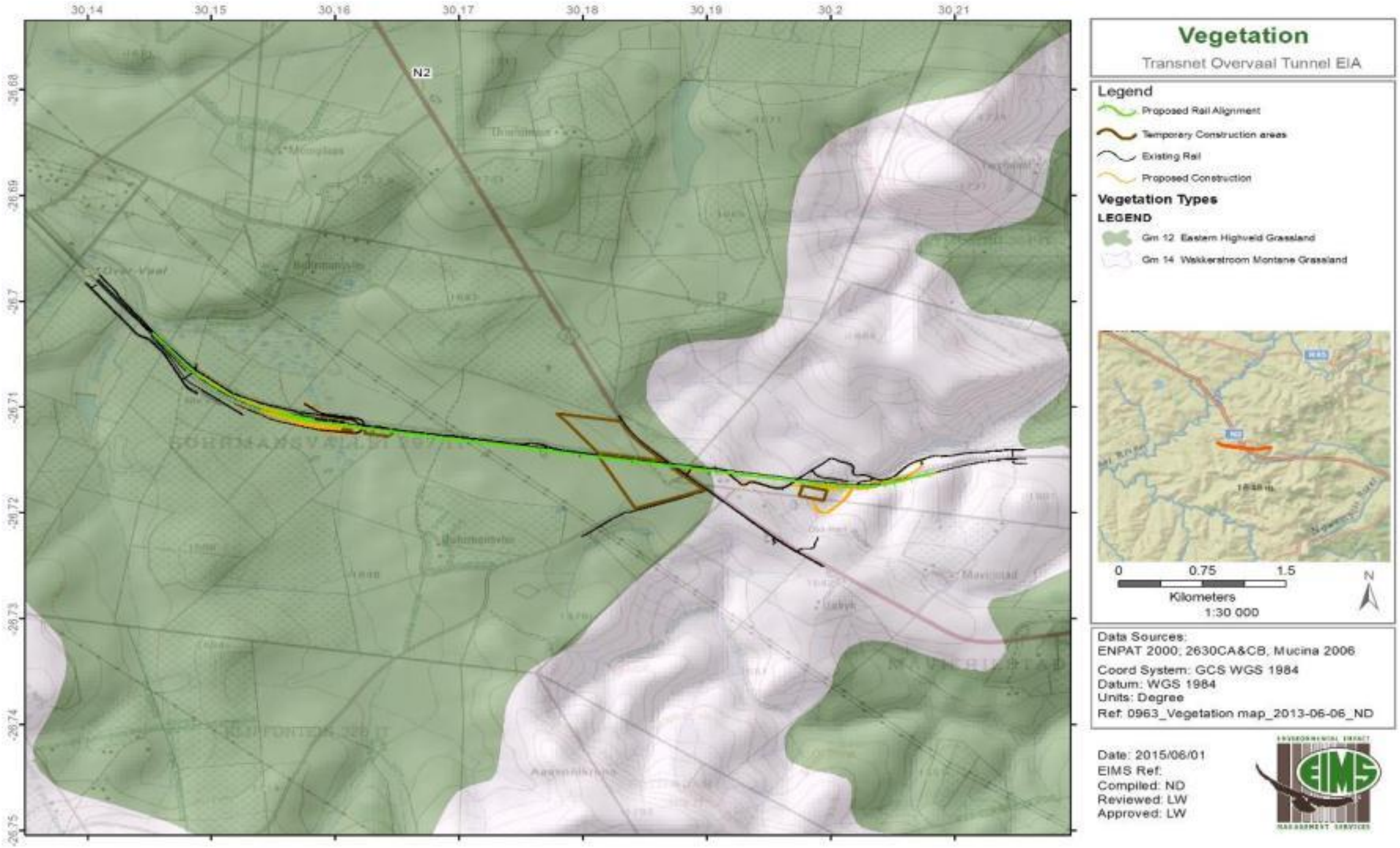

FIGURE 35: VEGETATION TYPES WITHIN AND AROUND THE PROPOSED PROJECT SITE.

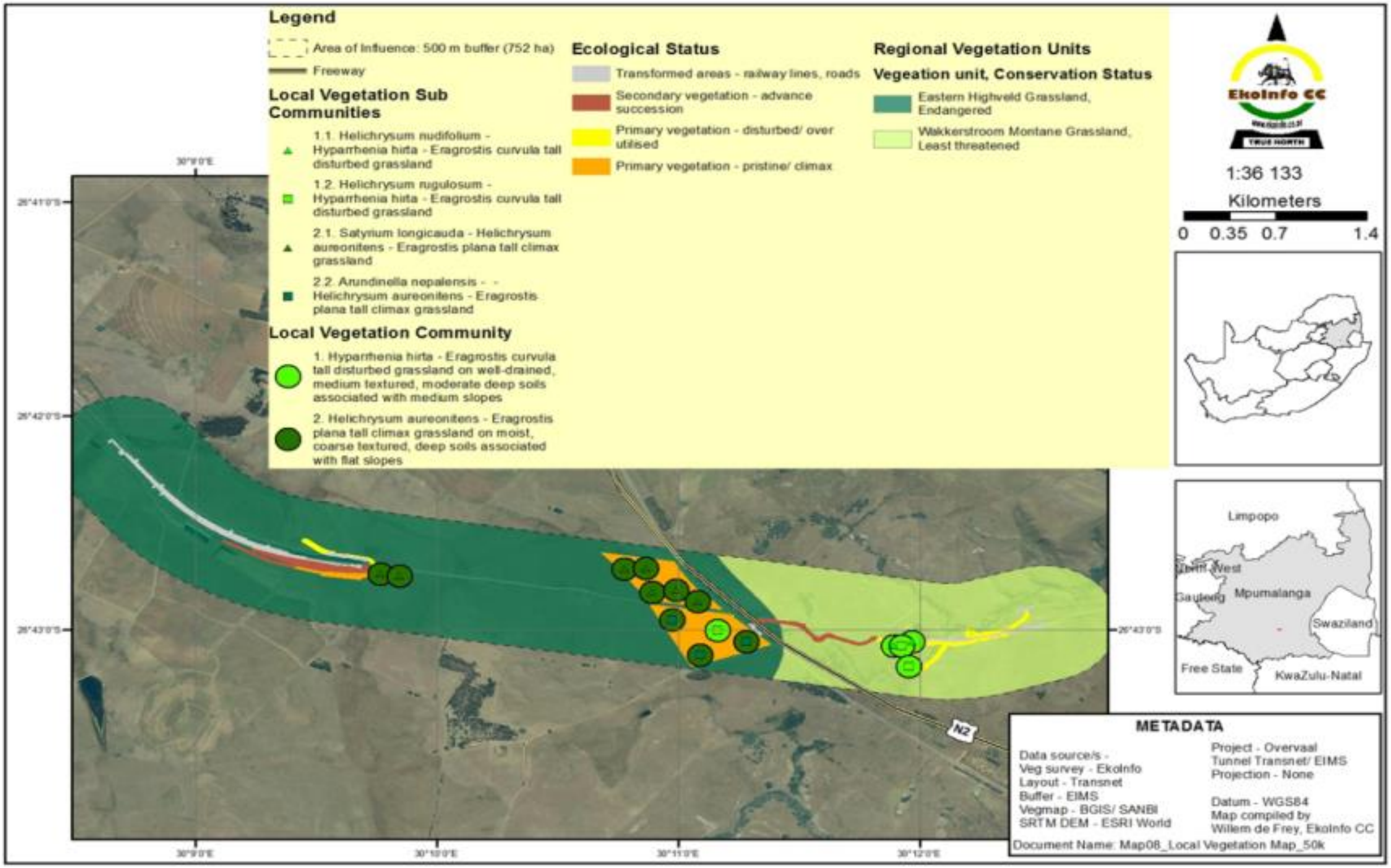

FIGURE 36: OVERVIEW OF THE DISTRIBUTION OF THE LOCAL VEGETATION COMMUNITIES AND SUB COMMUNITIES WITHIN THE STUDY AREA AND THE REGIONAL VEGETATION UNITS (DE FREY; 2015).

Community one: *Hyparrhenia hirta - Eragrostis curvula* tall disturbed grassland on well-drained, medium textured, moderate deep soils associated with medium slopes, represents a dry environment due to the presences of medium slopes and medium textured soils which contributes to rainfall run-off rather infiltration. The more incised slopes and higher clay content is attributed to the chemical of weathering of the igneous dolerite which underlays this unit in general. In high rainfall environments, igneous rock tends to weather quicker than the sedimentary or metamorphic rock, with the weathered igneous material being a source of fine textured soils. The slightly higher clayey content results in this unit keeping soil moisture for longer, thereby presenting sweetveld on a local scale which is favoured by livestock, which explains the over utilised status of the vegetation community, especially in close proximity to the human settlements.

Two sub communities where identified within this community, namely:

- 1.1.: *Helichrysum nudifolium - Hyparrhenia hirta - Eragrostis curvula* tall disturbed grassland; and
- 1.2: *Helichrysum rugulosum - Hyparrhenia hirta - Eragrostis curvula* tall disturbed grassland.

Sub community 1.1 represents localised areas where lateral movement of soil moisture occurs within the landscape, thereby favoured by livestock as a source of moisture, which results in additional pressure on this sub community as indicated by the presence of the forb *Helichrysum nudifolium*. The number of species associated with disturbance supports this observation. The soil moisture moves in a shallow E-horizon (B1 subsoil), on top of either a soft plinthic B or yellow-brown apedal B horizon. In contrast sub community 1.2 is associated with yellow-brown apedal B subsoils with an average depth of 700 mm. Yellow-brown apedal B subsoils are associated with well-drained soils and therefore experience less grazing pressure. The absence of species associated with moist areas supports this statement. It is evident based on the observations within this portion of the proposed development footprint and associated infrastructure, that well-defined wetlands are absent.

Community two: *Helichrysum aureonitens - Eragrostis plana* tall climax grassland on moist, coarse textured, deep soils associated with flat slopes, represents a moist environment due to the presences of flat slopes and coarse textured soils which contributes to rainfall infiltration rather runoff. Due to the flat nature of the landscape in this area, deep soils developed in which the finer material was moved down in the soil profile resulting in the accumulation of fine material (clay and silt), with the coarse material remaining at the top, due to the high rainfall (699 – 972 mm), the soil profile becomes either temporarily or permanently saturated, resulting in the lateral movement of soil moisture along the gentle slope. The presence of an E-horizon, soft plinthich B and G-horizon with higher estimated clay content supports this statement. The vegetation reflects the presence of temporarily (E-horizon), seasonally (soft plinthic) or permanently (G-horizon) saturated soils close to the surface. Two sub communities where identified within this community, namely:

- 2.1. *Satyrium longicauda - Helichrysum aureonitens - Eragrostis plana* tall climax grassland; and

- 2.2. *Arundinella nepalensis - Helichrysum aureonitens - Eragrostis plana* tall climax grassland.

Sub community 2.1 represents the temporary to seasonal moist/ wet areas within this community, due to the presence of shallower soils and less thick E-horizon compared to sub community 2.2. Sub community 2.2 has on average deeper soils, as well as a thicker E-horizon, which implies there is more potential to store more soil moisture for longer. The higher average wetness index associated with this sub community support this statement, because it indicates a higher tendency for water to accumulate in this sub community. The distribution of this sub community is indicated by the presence of the following two species: *Arundinella nepalensis, Helictotrichon turgidulum*.

Overall, based on the observations made within community two within the proposed development footprint and associated infrastructure, it is concluded that community two presents moist grassland in a pristine conditions. The wetness is the result of both high rainfall potential and soil conditions, with soil moisture moving both laterally (E-horizon) within the soil profile as well as vertical (soft plinthic B, G-horizon). The vertical soil moisture potentially represents a perched water table, on a clayey layer such as mudstone or shale, which could surface in the landscape as springs. Springs were noted in the area.

From a landscape ecological perspective the study area (development footprint and associated infrastructure) can be divided into four areas:

1. Primary vegetation - disturbed/ over utilised;
2. Primary vegetation - pristine/ climax;
3. Secondary vegetation - advance succession; and
4. Transformed areas - railway lines, roads.

Community one and two represents the primary vegetation within the study area and covers combined approximately 72%, while the secondary vegetation (12%) is associated with areas in close proximity of existing infrastructure, which had been transformed during the construction of the infrastructure but has since then began to revert back to natural vegetation through succession. Known pioneer species such as *Hyparrhenia filipendula, H. hirta* dominate these areas; these areas are also prone to infestation by declared alien invasive species such as *Acacia mearnsii* (Black wattle) and other wattle species.

The existing roads, railway lines, cultivated fields/ pastures and buildings (silo, homesteads) are part of the transformed areas and covers 16%. Limited or no vegetation occurs within these areas, the vegetation present are generally either weeds, invasive species, commercial or ornamental species.

Based on these observations, it is evident that the study area is mainly associated with natural vegetation, current or historically transformed areas representing only 28%, which implies that the construction of the additional tunnel will have an influence on the natural vegetation in the area.

5.3.1.2. SPECIES DIVERSITY

5.3.1.2.1. REGIONAL CONTEXT

Available regional information from the South African National Biodiversity Institute's (SANBI) POSA website, indicates that across the nine topocadastral grids associated with the study area and surroundings 1 131 species had been recorded, in which the grid associated with the study area (2630CA), 265 species had been recorded. Of the 1 131 species, 13 species belong the Red Data threatened category consisting of Vulnerable (VU), Endangered (EN) and Critical Endangered (CR) species, of which the vulnerable geophyte *Gladiolus malvinus* had been recorded within the topocadastral grid associated with the study area.

Amongst the 9 topocadastral grids, the following provincially protected species, genera and families in terms of the Mpumalanga Nature Conservation Act (No 10 of 1998) were recorded:

- *Hesperantha coccinea, Iridaceae* Family.
- 51 species across the following 16 genera: *Adenia, Agapanthus, Aloe, Brachystelma, Brunsvigia, Ceropegia, Crinum, Cyrtanthus, Dioscorea, Eucomis, Gladiolus, Haemanthus, Kniphofia, Scadoxus, Watsonia, Zantedeschia,* the following eight genera were recorded within topocadastral grid 2630CA: *Brachystelma, Crinum, Dioscorea, Gladiolus, Haemanthus, Scadoxus, Watsonia, Zantedeschia.*
- 40 species across the following two families: *Orchidaceae* and *Proteaceae*, the following four species were within the topocadastral grid 2630CA: *Disa chrysostachya, Disa stachyoides, Eulophia hians.*

Five nationally protected species in terms of the NEMBA were listed in the 9 topocadastral grids: *Asclepias bicuspis, Dioscorea sylvatica, Pelargonium sidoides, Protea roupelliae, Zantedeschia pentlandii.* It should be noted that *Dioscorea sylvatica* had been recorded in the topocadastral grid 2630CA with which the study area is associated.

It is evident from the above information that there is a high likelihood that species of concern (threatened Red Data and protected species – both national and provincial) will be present within the proposed project study area.

5.3.1.2.2. LOCAL CONTEXT

This section discusses the species diversity on a local level/ scale in terms of the two identified vegetation communities:

- *Hyparrhenia hirta - Eragrostis curvula* tall disturbed grassland; and
- *Helichrysum aureonitens - Eragrostis plana* tall climax grassland.

The following aspects will be addressed:

1. Species richness
2. Species of concern: Threatened Red Data plants; Protected vegetation – provincial and national; Medicinal vegetation; and
3. Alien invasives.

Species Richness:

During the survey 137 species were recorded (Alpha-diversity), these 137 species represents 39 families, of which the following ten families contain more than 70% of the species: A*canthaceae, Asteraceae, Cyperaceae, Fabaceae, Hyacinthaceae, Hypoxidaceae, Iridaceae, Orchidaceae, Poaceae, Rubiaceae*. In addition these 137 species represent 104 genera, of which the following 19 genera contains two or more species: *Andropogon, Aristida, Berkheya, Conyza, Cyperus, Eragrostis, Gladiolus, Haplocarpha, Helichrysum, Hyparrhenia, Hypoxis, Indigofera, Ledebouria, Paspalum, Pentanisia, Senecio, Sporobolus, Striga, Verbena*. Overall the 137 species recorded during the vegetation survey represent 98% of the important taxa listed in the regional vegetation units and 19% more than recorded within the 18 plots at landscape level.

Between the communities, community one and two, the species richness (Beta-diversity) is on average overall higher for community one than for community two. These results reflect on the trend that fewer species are adapted to live in waterlogged environments (wetlands) and that sub climax (utilised) vegetation has higher species richness than climax or pristine vegetation. The latter is attributed to the presence of pioneer or increaser species generally absent from pristine or climax communities.

Overall, it can be concluded that the 137 species recorded over the three day survey within the study area (development footprint and associated infrastructure) is representative of the species in the study area, as the number of species added to the total species list were levelling off.

Species of Concern

In general four species of concern are recognised:

1. Threatened Red Data species: No threatened (Vulnerable, Endangered, Critical Endangered) Red Data plants were recorded within any of the plots surveyed. However it should be noted that two unidentified *Gladiolus* species had been recorded within the study area, mainly in association with community two. Thus one of the two unidentified *Gladiolus* species could be the vulnerable *Gladiolus malvinus* recorded within topocadastral grid 2630CA in which the study area occurs, however flowering plants would be required to verify their identity or the contribution of a *Gladiolus* specialist.

2. Protected species: No nationally protected species in terms of the National Environmental Management Biodiversity Act had been recorded within the plots surveyed. Ten provincial protected species in terms of the Mpumalanga Nature Conservation Act (No 10 of 1998) were recorded within the plots surveyed, namely: *Aloe ecklonis, Disa cooperi, Eucomis autumnalis, Gladiolus species 1, Gladiolus species 2, Gladiolus crassifolius, Habenaria species, Satyrium longicauda, Scilla nervosa, Watsonia species*. It should be noted that with the exception of *Eucomis autunalis*, all species of the genera *Aloe, Gladiolus, Scilla and Watsonia* and all species of the family *Orchidaceae* are protected. Seven of the ten protected species were recorded within community two.

3. Medicinal species: Five species with medicinal properties were recorded within the plots surveyed, they are: C*entella asiatica, Eucomis autumnalis, Hypoxis hemerocallidea, Pelargonium luridum, Pentanisia prunelloides*. Community one contained four out of the five species, while community two contained three.

4. Alien invasive species: Only one alien invasive species in terms of the CARA was recorded within the plots surveyed, specifically within community one, namely *Campuloclinium macrocephalum*. This alien invasive species is a Category 1 plant which implies they "are weeds and serve no useful economic purpose and possess characteristics that are harmful to humans, animals or the environment." Category 1 species have to be controlled. Although not recorded within the plots surveyed, alien invasive woody species where noted especially within community one and adjacent landscape, these include Black Wattle (*Acacia mearnsii*) – a category 1 species and Bluegum (*Eucalyptus* species) – mainly category 2 species. Category 2 species needs to be controlled outside demarcated areas. *Campuloclinium macrocephalum* is a Category 1b species in Mpumalanga in terms of the NEMBA, which implies it needs to be controlled in as part of an invasive species control programme, the Wattles and Bluegums are also mainly category two in terms of the same act, which implies they are invasive species which are regulated by area, however the Bluegums qualify for Category 1b when they are close to water sources (riparian or wetland areas) or in protected or threatened ecosystems. Therefore an alien control plan will be a crucial component of the Environmental Management Plan to ensure that topsoil containing seed contaminated with alien invasive species from community one or close to transformed or secondary areas, is not moved into community two, (refer to **FIGURE 37**below for study area sensitivity)

5.3.1.3. LOCAL SENSITIVITY AND DISCUSSION

The local floristic sensitivity is based on the information collected during the survey both on a regional and local level. The sensitivity was calculated using a weighted scale and the parameters below per community:

- Regional vegetation unit
- Provincial conservation area
- Ecological status - local
- Beta diversity (137 = 100%)
- Local - Threatened Red Data plants (1 = 100%)
- Provincially protected species (10 = 100%)
- Medicinal plants (5 = 100%)
- Alien invasive species (2 = -100%)

From this assessment it is evident that the area associated with community one (*Hyparrhenia hirta - Eragrostis curvula* tall disturbed grassland on well-drained, fine textured, deep soils associated with medium slopes) is of moderate floristic sensitivity (41%), while the areas associated with community two (*Helichrysum aureonitens - Eragrostis plana* tall climax grassland on moist, coarse textured, very deep soils associated with flat slopes) is of high floristic sensitivity (63%).

The data available indicates that the study area is located in a transitional zone on a national, regional and local level. Transitional zones (ecotones) are generally associated with high species richness, which the current study confirmed. The remaining natural vegetation within the study area (development footprint and associated infrastructure) is in a moderate to high sensitivity state, with provincially protected species occurring in all areas and a high likelihood of a threatened Red Data species in community two. Therefore it will be prudent to avoid establishing/ placing the associated infrastructure (lay down areas, offices and stockpiles) on the natural vegetation but rather on the transformed and secondary vegetation.

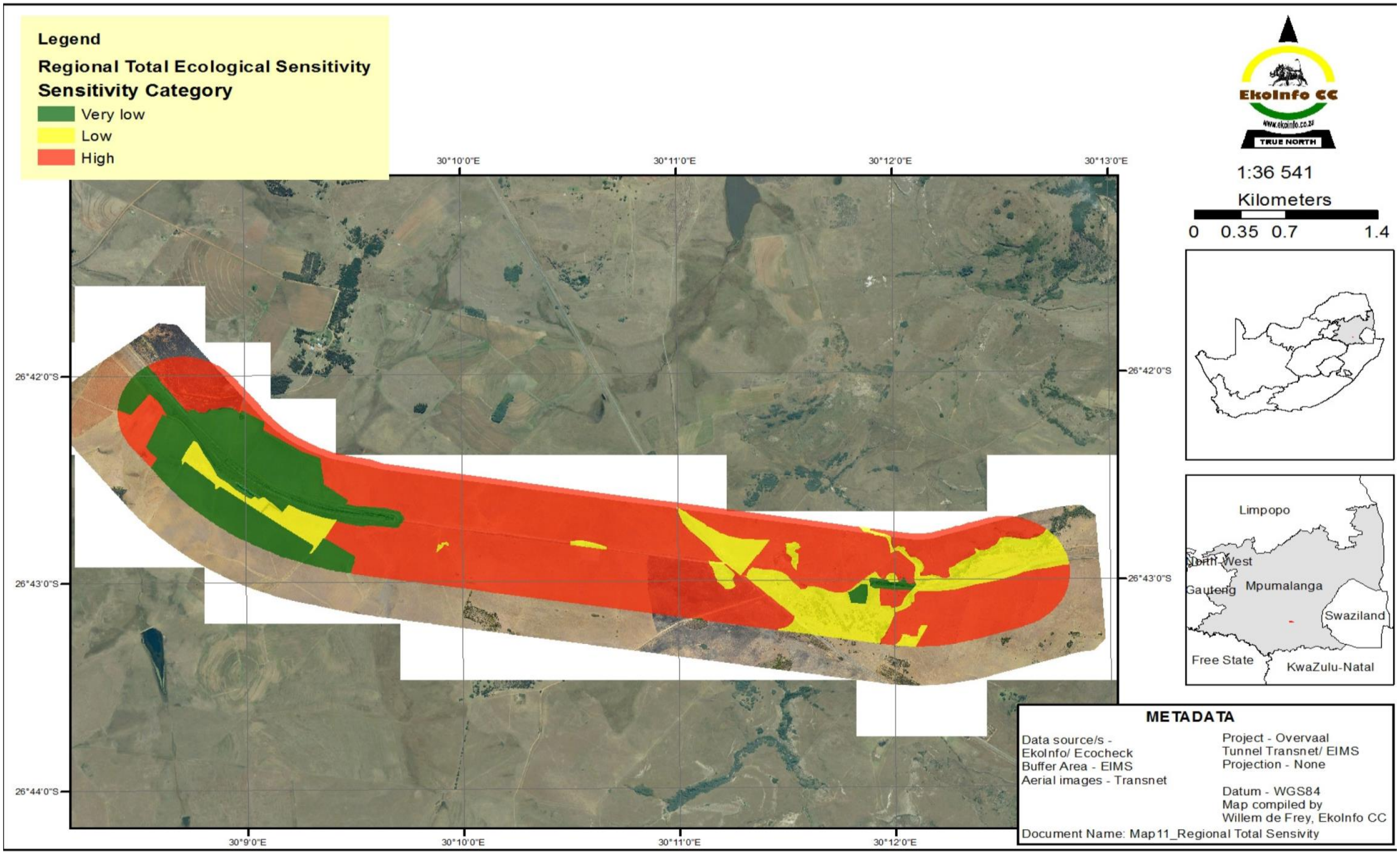

FIGURE 37: VIEW OF THE REGIONAL SENSITIVITY

5.3.2. FAUNA

An ecological specialist assessment has been undertaken for the project. This section presents relevant extracts from this study. Please refer to Appendix F for the full report and supporting information.

5.3.2.1. SPECIES DIVERSITY

During the field investigation, fifty-five animal species were confirmed to occur in the study area (**Table 15**). These included the alien and invasive *Astylus atromaculatus* (Spotted Maize Beetle). The animal inhabitants confirmed for the area investigated, also included one Red Data species (Secretary Bird). The Secretary bird, *Sagittarius serpentarius,* is relatively widespread in South Africa, and found in all nine provinces of the country. The species inhabits grasslands, ranging from open plains to lightly wooded savanna, but is also found in agricultural areas and sub-desert. It ranges from sea level to 3 000 meters above sea level. A variety of prey is consumed, primarily insects and rodents, but also other mammals, lizards, snakes, eggs, young birds and amphibians. Breeding occurs throughout the year and the species typically nests in flat-topped Acacia trees, where it constructs a flattened stick structure. Major threats to the species include excessive burning of grasslands, intensive grazing, cultivation, urbanization, illegal trade and direct hunting and nest raiding. The species is listed as Vulnerable A4acd (IUCN 2015).

The other fifty-three animal inhabitants of the study area confirmed during the field investigation are commonly found in the grasslands and associated wetlands of the Mesic Highveld Grassland Bioregion of South Africa. The woodland elements present in the study area (mostly stands of exotic trees) also contributed species to the list, such as Acacia Pied Barbet, Black-headed Oriole and Red-throated Wryneck. The confirmed animal inhabitants of the study area included:

- One dragonfly;
- Three beetles;
- Six butterflies;
- One bee;
- Thirty-nine birds;
- One rodent;

- Three mongooses; and
- The Aardvark.

TABLE 15: ANIMAL SPECIES FOUND TO OCCUR IN THE STUDY AREA (DE FREY; 2015).

Class	Order	Family	*Genus species*	English Name
Insecta	Odonata	Aeshnidae	*Anax imperator* Leach, 1815	Blue Emperor
	Coleoptera	Scarabaeidae	*Porphyronota hebraea* (Olivier, 1789)	Marbled Fruit Chafer
		Tenebrionidae	*Lagria* species	Hairy Darkling Beetle
		Melyridae	*Astylus atromaculatus*	Spotted Maize Beetle
	Lepidoptera	Pieridae	*Catopsilla florella* (Fabricius, 1775)	African Migrant
			Eurema brigitta (Stoll, [1780])	Broad-bordered Grass Yellow
			Pontia helice (Linnaeus, 1764)	Common Meadow White
		Nymphalidae	*Danaus chryssipus orientis* (Aurivillius, 1909)	African Monarch
			Junonia hierta cebrene Trimen, 1870	Yellow Pansy
			Vanessa cardui (Linnaeus, 1758)	Painted Lady
	Hymenoptera	Apidae	*Apis mellifera scutellata* Lepeletier, 1836	African Honey Bee
Aves	Galliformes	Numididae	*Numida meleagris* (Linnaeus, 1758)	Helmeted Guineafowl
		Phasianidae	*Scleroptila levaillantii* (Valenciennes, 1825)	Red-winged Francolin
			Coturnix (Linnaeus, 1758)	Common Quail
	Anseriformes	Anatidae	*Anas undulata* C.F. Dubois, 1839	Yellow-billed Duck
	Ciconiiformes	Ciconiidae	*Ciconia* (Linnaeus, 1758)	White Stork
		Threskiornithidae	*Bostrychia hagedash* (Latham, 1790)	Hadeda Ibis
		Ardeidae	*Bubulcus ibis* (Linnaeus, 1758)	Cattle Egret
	Falconiformes	Sagittariidae	*Sagittarius serpentarius* (J.F. Miller, 1779)	Secretarybird
		Accipitridae	*Elanus caeruleus* (Desfontaines, 1789)	Black-shouldered Kite
			Buteo (Linnaeus, 1758)	Common Buzzard
		Falconidae	*Falco amurensis* Radde, 1863	Amur Falcon
	Charadriiformes	Charadriidae	*Vanellus armatus* (Burchell, 1822)	Blacksmith Lapwing
	Columbiformes	Columbidae	*Columba guinea* Linnaeus, 1758	Speckled Pigeon
			Streptopelia capicola (Sundevall, 1857)	Cape Turtle-Dove
			Streptopelia senegalensis (Linnaeus, 1766)	Laughing Dove
	Cuculiformes	Cuculidae	*Chrysococcyx caprius* (Boddaert, 1783)	Diderick Cuckoo
	Apodiformes	Apodidae	*Apus* (Linnaeus, 1758)	Common Swift

	Piciformes	Lybiidae	*Tricholaema leucomelas* (Boddaert, 1783)	Acacia Pied Barbet
		Picidae	*Jynx ruficollis* Wagler, 1830	Red-throated Wryneck
	Passeriformes	Laniidae	*Lanius collaris* Linnaeus, 1766	Common Fiscal
		Oriolidae	*Oriolus larvatus* Lichtenstein, 1823	Black-headed Oriole
		Hirundinidae	*Hirundo abyssinica* Guérin-Méneville, 1843	Lesser Striped Swallow
			Hirundo rustica Linnaeus, 1758	Barn Swallow
			Riparia cincta (Boddaert, 1783)	Banded Martin
			Riparia paludicola (Vieillot, 1817)	Brown-throated Martin
		Cisticolidae	*Cisticola ayresii* Hartlaub, 1863	Wing-snapping Cisticola
			Cisticola juncidis (Rafinesque, 1810)	Zitting Cisticola
			Cisticola tinniens (Lichtenstein, 1842)	Levaillant's Cisticola
		Sturnidae	*Onychognathus morio* (Linnaeus, 1766)	Red-winged Starling
		Muscicapidae	*Saxicola torquatus* (Linnaeus, 1766)	African Stonechat
			Myrmecocichla formicivora (Vieillot, 1818)	Anteating Chat
		Ploceidae	*Quelea* (Linnaeus, 1758)	Red-billed Quelea
			Euplectes afer (J.F. Gmelin, 1789)	Yellow-crowned Bishop
			Euplectes orix (Linnaeus, 1758)	Southern Red Bishop
			Euplectes progne (Boddaert, 1783)	Long-tailed Widowbird
			Ploceus velatus Vieillot, 1819	Southern Masked-Weaver
		Viduidae	*Vidua macroura* (Pallas, 1764)	Pin-tailed Whydah
		Motacillidae	*Motacilla capensis* Linnaeus, 1766	Cape Wagtail
			Macronyx capensis (Linnaeus, 1766)	Cape Longclaw
Mammalia	Rodentia	Bathyergidae	*Cryptomys hottentotus* (Lesson, 1826)	Common Mole-rat
	Carnivora	Herpestidae	*Atilax paludinosus* (G. [Baron] Cuvier, 1829)	Marsh Mongoose
			Cynictis penicillata (G. [Baron] Cuvier, 1829)	Yellow Mongoose
			Galerella sanguinea (Rüppell, 1835)	Common Slender Mongoose
	Tubulidentata	Orycteropodidae	*Orycteropus afer* (Pallas, 1766)	Aardvark

5.3.2.2. RED DATA ASSESSMENT

One hundred and twenty-six red data species are known from Mpumalanga. These are included in five IUCN Red Data categories:

- Data Deficient (DD): 30 species;
- Near Threatened (NT): 43 species;
- Vulnerable (VU): 32 species;
- Endangered (EN): 17 species; and
- Critically Endangered (CR): 4 species.

The following Probabilities of Occurrence (PoC) within the study area are estimated for these 126 species:

- Low PoC: 63 species;
- Moderate-low PoC: 24 species;
- Moderate PoC: 16 species;
- Moderate-high PoC: 7 species; and
- High PoC: 15 species.

One Red Data species. The Secretary bird, Sagittarius serpentarius, listed as Vulnerable (IUCN Red List 2015) was confirmed for the study area during the field investigation.

5.3.2.3. HABITAT DIVERSITY

Four faunal habitat variations (ecologically divergent) are recognized within the study, for the purposes of this assessment:

- Primary vegetation: pristine or climax faunal habitat;
- Primary vegetation: disturbed or over-utilized faunal habitat;
- Secondary vegetation: advanced ecological succession; and
- Transformed areas: railway lines, roads, etc.

Based on the status, diversity, linkage, RD hosting ability and inherent sensitivity, it is estimated that the four faunal habitat variations have the following ecological sensitivities (Table 24):

- Primary vegetation: pristine or climax faunal habitat: high;
- Primary vegetation: disturbed or over-utilized faunal habitat: medium;
- Secondary vegetation: advanced ecological succession: low; and
- Transformed areas: railway lines, roads, etc.: very low.

TABLE 16: FAUNAL HABITAT SENSITIVITY ASSESSMENT (DE FREY; 2015).

Faunal Habitat Type	Status	Diversity	Linkage	RD	Sens	Ave	Sens Class
Primary vegetation: pristine	9	9	9	9	9	90%	high
Primary vegetation: disturbed	5	5	7	7	5	58%	medium
Secondary vegetation	3	3	6	4	3	38%	low

Transformed areas	1	1	2	1	1	12%	very low

5.3.2.4. DISCUSSION

The study area includes the usual variations of faunal habitat found throughout most of the Mesic Highveld Grassland Bioregion (pers. obs.). Disturbed primary vegetation, secondary vegetation and transformed areas are commonly found commonly in the southern parts of Mpumalanga. Crop agriculture, opencast coal mining and associated infrastructures in the region have seen the destruction of significant areas of the grasslands of southern Mpumalanga. However, the study area does include significant fragments of pristine grassland and associated wetlands. These fragments of pristine grasslands are not common in the landscape, and are becoming fewer as the pressures of a growing human population increase. The climax grassland fragments of the study area are of very good ecological quality, are biodiverse, are well linked to larger areas of primary grassland and have very good Red Data Species hosting abilities. Despite the small size of the study area, a good representation of grassland animals were encountered during the field investigation; this included the Vulnerable Secretary bird. Based on the ecological qualities and diversities of the study area (mostly of the primary vegetation fragments), it is estimated that fifteen other Red Data animals of Mpumalanga are highly likely to occur in the study area. These animals include six species listed as Data Deficient, four species listed as Near Threatened, four species listed as Vulnerable and one species, the Grey Crowned Crane, *Balearica regulorum*, listed as Endangered.

All results obtained during this assessment supports the estimated high sensitivity of the pristine primary vegetation faunal habitat fragments located within the study area's boundaries. It is proposed that the areas designated to have high faunal sensitivities (pristine primary vegetation) should be excluded from any activities and associated impacts during the construction and operational phases of the proposed project.

5.3.2.5. RAILWAY TUNNELS, BIRDS AND BATS

The ecological specialist study did not focus on the specific relationship between the artificial habitat created in, and around the current railway tunnel, and the avifaunal and bat communities of the study area. To address specific concerns regarding these two animal groups and the potential impact of an additional railway tunnel, would require a study aimed specifically at ascertaining the status of species currently affected by the tunnel (being adversely affected or benefiting). However, from the literature and brief observations at the mouth of the current tunnel, certain aspects are reasonably clear. The avifaunal communities of the study area have certainly adapted to the current railway tunnel. Many species have used the large railway cuttings found at both ends of the current tunnel as nesting spaces. These cuttings provide excellent nesting potential for various bird species. Birds of South Africa that are known to nest in cuttings (whether from roads, railways or quarries) include the Rock Kestrel and Orange Ground-thrush. Many bird species have been observed feeding at the mouths of the tunnel; these areas act as 'traps' for some flying invertebrates and this higher concentration of a favourite food source for many entomophagous birds lure many birds to these areas. Whether or not birds enter or nest within the railway tunnel is unknown; the inside of the current tunnel was not investigated during this study.

The literature on the association between bats and railway tunnels provides some insight. Human impacts have negatively affected bat populations and thereby this vertebrate group is considered to be globally threatened. Usually, direct human impacts, such as various disturbances in roosts and accumulation of pesticides were considered the main threats affecting bat communities. However, the changes were sometimes explained also by global climatic or environmental oscillations seeing that the development of bat numbers in hibernacula conspicuously correlated with annual variation of global temperature. Some bat species such as *Barbastella barbastellus* are able to find relatively quickly an alternative winter roost (such as a railway tunnel) with similar conditions and form similar mass aggregations there. The data suggest an apparent population increase of termophilous and originally cave dwelling species of bats.

It is clear from the literature that railway tunnels provide excellent roosting habitat for bats. However; the human disturbance factors limit the habitat potential for these tunnels as refugia for sensitive species. It is unclear from the literature studied whether or not the current and proposed railway tunnels will accommodate bats or not. Literature clearly indicates that each tunnel is unique and the habitat potential of railway tunnels are often determined by specific conditions such as temperature fluctuations, humidity, human disturbances and location in relation to food and water resources. Regarding this project, the interaction between bats and the two railway tunnels during the construction and operational phases can only be determined by a medium-term study that are specifically designed to address any concerns relating to these issues.

5.4. Socio-Economic and Cultural Environment

5.4.1. SOCIO-ECONOMIC ENVIRONMENT

The 2014 – 2015 Integrated Development Plan document is meant to guide development and planning for the financial year in question while also serving as a revised version of the 2011 – 2016 IDP. The IDP is therefore revised to address the changing circumstances and demands within the communities/civil society with emphasis on improving socio-economic situation, strengthening local economic development, meeting the millennium targets, improving service delivery mechanisms, strengthening and improving inter-governmental relations and community participation. The document is therefore prepared in accordance with the Municipality’s legal obligation in terms of Section 34 of the Local Government: Municipal Systems Act, 2000, Act 32 of 2000.

The municipality is predominantly rural in nature with key anchor towns that dominate the urban settlements. These create a big challenge for the municipality to provide services especially at the rural or farmlands and coordinated planning and development became expensive in services provision. The Municipality comprises of the following towns: Ermelo; Breyten; Davel; Sheepmoor; Lothair; Chrissismeer;

Warburton and Surrounding rural or farm lands. The Municipality also comprises of Mining operations, Timber Industries, Agricultural Land, Transport and Tourism areas as its economic base.

The labour force characteristics within Msukaligwa Municipality when comparing the period 2001 to 2011, employment rate stood at 42.6% in 2011 which has increased by 5.8% from 2001. There is a decrease of 7.2% in unemployment during the period 2001 to 2011. The economically active persons are showing a reduction in 2011 when compared to 2001 figures which may imply that people are being absorbed by the labour market or retiring as figures show an increase on those persons that are not economically active. There is still a lot be done in dealing with the unemployment challenge which the local municipality, district municipality, business/private sector and government sectors should collectively come up with strategies to deal with this problem. The statistics show that 13,615 jobs were created during the period 2001 to 2011 which reduced the unemployment rate to 15.6%, (Msukaligwa Municipality: Final Integrated Development Plan 2014 - 2015).

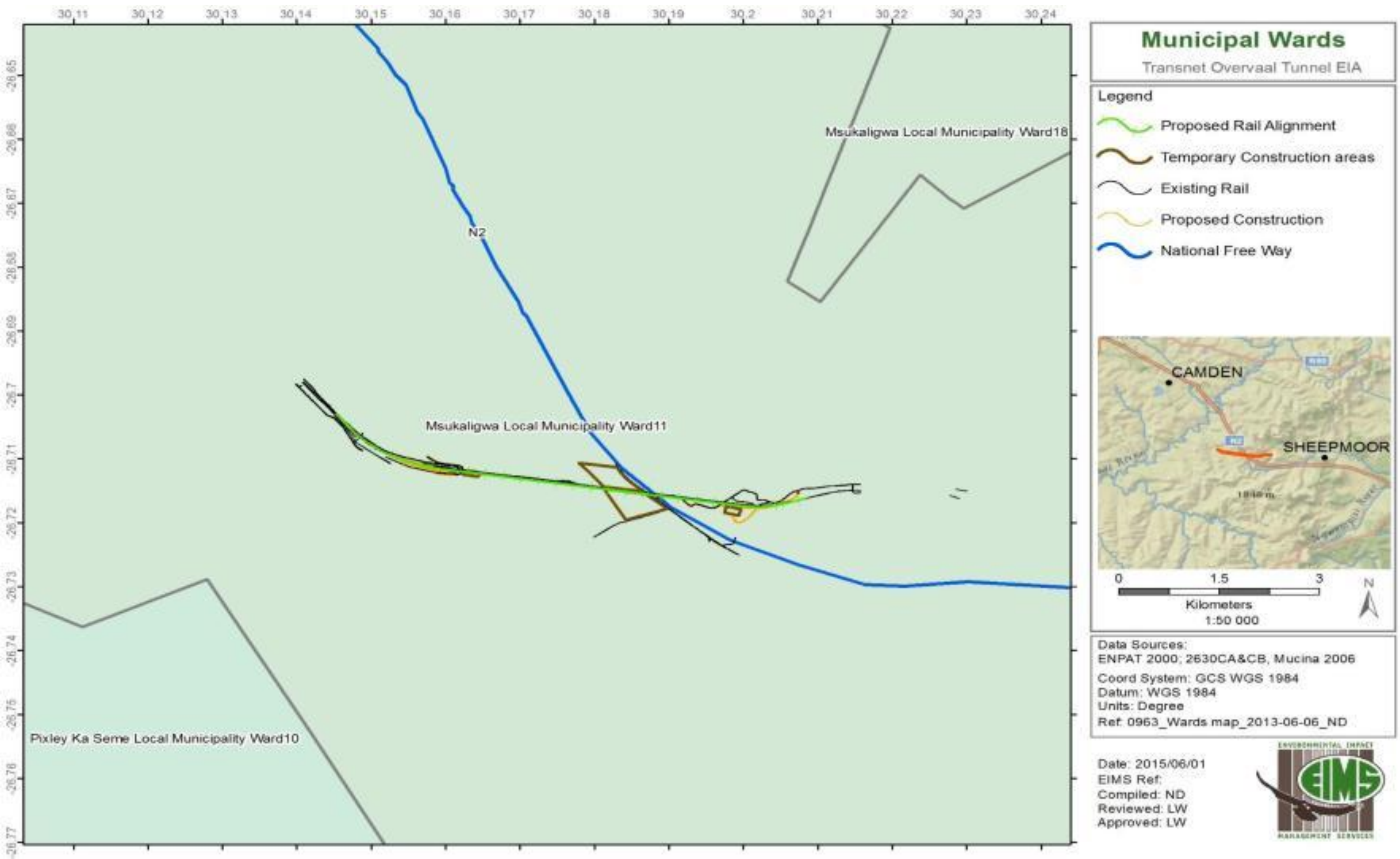

FIGURE 38: VIEW OF MLM WARD 11 WHERE THE PROPOSED PROJECT SITE IS SITUATED.

5.4.2. POPULATION STATISTICS FOR THE MLM

Msukaligwa population dynamics is based on statistics derived from Statistics South Africa 2001 to 2011, the Gert Sibande District Municipality and other sources. Statistics South Africa data had been used for the demographics and where data could not be derived from Statistics South Africa, other sources had been used. The population of Msukaligwa shows a growth of 19.7% from 2001 to 2011 at an average annual growth of 2% and grew with 24564 persons. There is also a significant increase on the Asian and Coloured population of 52% and 61% respectively during the period 2001 to 2011.

All age groups reflect increase in population with large age groups being 0 – 14 comprising of 45409 persons and 15 – 34 comprising of 57748 persons. The youth population contributes 39% of the total population of Msukaligwa. With the youth population contributing a larger percentage of the population, this is a clear indication that most of the youth are joining the job market implying that the municipality together with sector departments and NGOs must proactively engage in a joint effort to address issues of unemployment, skills development, provision of basic services and housing. According to the 2011 census data, females contribute 50.4% and males 49.6% of the total population of Msukaligwa municipality, (Msukaligwa Municipality: Final Integrated Development Plan 2014/2015).

TABLE 17: POPULATION STATISTICS OF THE MLM.

Demographics	Number of People	Distribution
Black	131625	88
White	14707	10
Coloured	892	0.6
Asian/Indian	1678	1.1
Other	475	0.3
Total	**149377**	**100**

5.4.3. INFRASTRUCTURE AND SERVICES WITHIN THE MUNICIPALITY

The following section describes the intentions of the Municipality in addressing some of the social challenges currently faced.

5.4.3.1. WATER PROVISION

The municipality shall through the District and in partnership with all spheres of government strive to meet the millennium target in ensuring access to water for all by 2015. Provision of clean drinking water (potable water) is still a challenge more especially at rural / farmlands within the municipality. In providing Water, the Municipality shall ensure that water is provided to schools, clinics and all other social amenities. It is therefore ensured that prior to approval of construction of clinics and schools there is water provided to such amenities more especially ensuring that farm schools have water where the farm owners cannot provide. The municipality is a water services authority and therefore responsible for supply of water within its area of jurisdiction.

While the supply of water to residents of the municipality is of high priority, the municipality must further ensure that water supplied is of good quality thus being compliant to the blue drop quality standards. To ensure continuous monitoring of water quality within the district, Gert Sibande District Municipality water testing laboratory situated in Msukaligwa, Ermelo has been built to service the district. Water testing is therefore done on a monthly basis. The appointment of Randwater to assist with Operations and maintenance for the next 3 years will also have an effect on improving the water quality in Msukaligwa.

The Ermelo and Wesselton areas are currently experiencing water supply crises due to the raw water supply dams running dry. Due to the drought problem, the Ermelo area was declared a disaster area and DWA intervened in assisting the municipality by funding for the provision of an emergency 350mm gravity feed main pipeline that will supply the Northern water treatment works with raw water. Also as a temporary measure, water to residential households at the affected areas is being supplied through water carts. A permanent 400mm pipeline is currently under construction. This will ensure maximum water supply to both purification plants in drought situations, (Msukaligwa Municipality: Final Integrated Development Plan 2014/2015).

5.4.3.2. SANITATION

Proper sanitation provision still remains a challenge in the municipality. There are a large number of people in direct need of proper sanitation facilities. The vastness of wards within the municipality and private land owners is problematic with regards to sanitary service delivery. The municipality planned to meet the challenge of eradicating the bucket system by 2007, and replace them with water borne and VIP pit latrine systems at those units where buckets were used. Sheepmoor is an area without proper sanitary services and the municipality is in the process of installing a sewer network. Currently proper sanitation within the municipality is still a challenge which requires long term planning (Public Service Commission, 2013).

Proper sanitation provision still remains a challenge in the municipality. There is high number of people in dire need for proper sanitation facilities. The vastness of wards within the municipality and private land owners is problematic when coming to sanitation service delivery. The municipality planned to meet the challenge of eradicating the bucket system by 2007, and replace them with water borne and VIP pit latrine systems at those units where buckets were used. Sheepmoor is another area without proper sanitation services and the municipality has installed sewer network which is not yet completed. As mentioned above it should be noted that there are those areas where it is difficult to render proper sanitation services and the municipality is therefore engaging all relevant stakeholders to seek solutions for the problem areas.

5.4.3.3. ELECTRICITY

Msukaligwa Local municipality comprises seven admin units. Electricity supply is therefore rendered by the municipality where license is held by the municipality and by Eskom for those areas licensed to Eskom. There are no backlogs with regard to electricity supply the reason being that electricity connections can only be done to existing structures. Since the connections rely on the houses built, there won’t be any backlog for electricity connections. The only challenge is at the farms where some land owners are not willing to contribute towards electrification of their farm dwellers.

5.4.3.4. HOUSING

The main challenge faced by the municipality is the shortage of land for housing purposes at some units of the municipality and the only way to overcome this challenge is by securing enough land for human settlements and other social amenities. Due to financial constrains the municipality is unable to secure/procure enough land for this purpose and therefore rely on assistance from Department of Rural Development and Land Reform (DRDLR), Department of Agriculture, Rural Development and Land Administration (DARDLA), Department of Cooperative Governance and Traditional Affairs (COGTA) and other funding sources to secure land for housing. Assistance should therefore be sought from the said departments to assist in funding for land that can be utilised for sustainable human settlement. Since human settlement goes along with other basic services, a challenge still remains with the municipality to service some of the land available for human settlements which is one of the most contributing factors to housing backlog as communities cannot be housed without services. The municipality should therefore work jointly with the District and all relevant government departments in order to overcome this backlog.

The municipality had over the past five years received allocations for a number of low cost housing units. A total of 648 housing units are still outstanding. Some of the outstanding units have been built but not completed while others were not built at all. There are factors contributing to this problem which may include slow completion of projects, insufficient sites for housing, uncontrolled land invasion (illegal Squatting), farm evictions and urban migration of employment seekers, (Msukaligwa Municipality: Final Integrated Development Plan 2014/2015).

5.4.3.5. ROADS

Msukaligwa municipality is being crossed through by the three National roads which are N17 going through to Swaziland, N2 Through to KZN East coasts and N11 through to KZN Newcastle. N4 (Maputo Corridor) Pretoria through Nelspruit to Mozambique is one of the corridors passing at the North of Msukaligwa Municipality linking Msukaligwa through N11. This corridor is situated at a distance of less than 90km from the Northern border of Msukaligwa. These corridors are linking the municipality with major economic hubs like Gauteng, Harbours and International countries like Swaziland and Mozambique. Road and rail haulage of coal supplying power stations and exports has also contributed in provision of job opportunities to communities within and outside the municipal boundaries. Economic opportunities should therefore be explored on the proposed Lothair – Swaziland rail link and the Majuba rail link.

5.4.3.6. HEALTH FACILITIES

Over the past five years, 300 new health facilities have been built, including 160 new clinics. Ten new hospitals have been built or refurbished in Ladybrand, Germiston, Mamelodi, Natalspruit, eThekwini, Zola, Bojanala, Vryburg District, Swartruggens, Khayelitsha and Mitchell’s Plain. Mother to child transmission of HIV has declined sharply and the number of people who are receiving anti-retroviral treatment, from one million to 2.4 million people in 2013.

The target for the next administration is to ensure that at least 4.6 million people are enrolled in the anti-retroviral programme.

5.4.3.7. EDUCATION FACILITIES

Taking into consideration the way in which the municipality is growing and the shortage of skills within communities, there is a need for at least a tertiary institution within the District. With development of Ermelo extension 32, 33 and 34 with a total of ± 2134 housing units and neighbouring New Ermelo settlement with ± 1650 housing units there is need for a high school in addition to the six high schools currently available.

The matric pass rate has gone up from around 61 percent in 2009 to 78 percent last year and the bachelor passes improve each year. The teacher training and are re-opening teacher training colleges to meet the demand is also been investigated. 370 new schools replacing mud schools and other unsuitable structures were built around the country and the programme continues. Student enrolments at universities increased by 12% while further Education and Training college enrolments have increased by 90%, (Msukaligwa Municipality: Final Integrated Development Plan 2014/2015).

5.4.3.8. WASTE MANAGEMENT

The waste management services offered by the Msukaligwa Local Municipality has been evaluated in terms of waste management service delivery, i.e. waste collection and refuse removal, disposal and recycling. A comprehensive study has been undertaken to obtain and evaluate the status quo of waste management within the municipality. Arising out of this study, gaps in service delivery and the needs and priorities of the municipality have been identified. The report has revealed that the ideal waste management situation is not yet achieved. This includes:

- Non-compliance with the environmental legislation and non-adherence to the operation of landfill sites as accordance with the prescribed standards.
- Financial constraints due to limited budget allocated for waste management.
- Aging and unreliable machinery to enable the departments operation.
- Low morale amongst the departmental staff.
- Lack of formalization of recycling, illegal dumping where service is not rendered as well as lack of inadequate Waste Information System.

These needs and gaps identified will be used in subsequent phases of the proposed project to develop plans and strategies in order to improve the efficiency and effectiveness of the Waste Management services undertaken by the municipality

5.4.4. TOURISM

Tourism also contributes to economic growth of the municipality as being boosted by areas like the Lake Chrissie wetlands, the Big foot at Athurseat, the bushman paintings at Breyten area and hospitality areas like Indawo game lodge.

The Chrissiesmeer lakes and wetland area is one of the most unique wetland areas in South Africa and is a world-renowned bird-watching area. Some important ecological habitats also exist in the eastern parts of the municipality, in the Warburton area. Furthermore there are also a number of sites of historical significance, such as old battle fields. The town of Chrissiesmeer has a historical character with many good examples of old Transvaal architecture and some sandstone houses and structures worth conserving. The town has potential to develop into a tourism hub, however development has to be dealt with sensitively in order not to destroy the existing ambiance and charm of the town. In 2014 an area of 60 000 around the town was declared as a protected area.

In terms of statistics derived from Global Insight, Recon (Pty) Ltd., Regional Economic Explorer Version 2.0C, Msukaligwa municipality is estimated to be contributing R 45 353.00 per annum to the regional economy and the province. The municipality should through the District strive to expand the economic contribution through the economic growth and development strategy.

Regionally MLM is well-located on the crossroads of three major national roads (N2, N11 and N17), approximately halfway between Gauteng and the Mpumalanga lowveld and Kruger National Park, which makes it a convenient stopover for tourists traveling between these two destinations. The area is also close enough to Gauteng to serve as a weekend tourist destination, similar to places such as Dullstroom (Msukaligwa Spatial Development Framework, 2010: Final Report).

5.4.5. CULTURAL, ARCHAEOLOGICAL, AND HISTORICAL ENVIRONMENT

A heritage impact assessment has been undertaken for the project. This section presents relevant extracts from this study. Please refer to Appendix I for the full report and supporting information.

5.4.5.1. REGIONAL CONTEXT

The province of Mpumalanga is known to be rich in archaeological sites that tell the story of humans and their predecessors in the region going back some 1.7 million years. The archaeological history of the area can broadly be divided into a Stone Age, Iron Age and Historic Period. Both the Stone and Iron Ages form part of what is referred to as the Pre-Colonial Period (Prehistoric Period) whereas the Historic Period is referred to as the Colonial Period as well.

The Later Stone Age began about 20 000 years ago, and, in the eastern Transvaal as well as elsewhere in Africa, only ended in the 19th century when the region underwent profound social, political and economic change. The Later Stone Age was a period of rapid social and technological advancement compared to the aeons that went before. Hunter-gatherers, ancestors of the Bushmen or San, lived throughout the eastern Transvaal. Archaeologists have investigated some of the old shelters in the present-day areas of Witbank, Ermelo, Barberton, Nelspruit, White River, Lydenburg, and Ohrigstad. Lake Chrissie, with its lakes, pans, caves and wide variety of game and edible plants, was an especially favoured area in more recent times.

The period between AD 400 and AD 1100 is known as the Early Iron Age. Early farmers arrived in the region from the north, bringing with them a different way of life, new technology, and trade. The early farmers and the hunter gatherers interacted with each other. The early farmers had metal tools, beads, produce, and domestic animals that were valuable to the hunter-gatherers. The hunter-gatherers did some work for the early farmers in exchange for these commodities. They tended cattle, but more importantly could offer their hunting and ritual skills, as well as knowledge of the area, to the farmers. It is possible that early farmers valued the ceremonies of the San because the San were the first people there, and so had a greater ritual authority in a region still unknown to the new arrivals.

The archaeological and historical overview of the study area and surrounding landscape is summarised in a chronological manner in table form below. Although the study area and surrounding landscape would have been well suited for human habitation over the last 1.7 million years, very little information is known about especially the archaeological history of the area. This can likely be attributed to a lack of research focus in this area over the past half a century or more and does not necessarily mean that no such sites exist within this area.

In terms of the historical overview provided below, it must be noted that such an overview which is based on available literature and archival research would necessarily reflect a bias toward a traditional white history of the region as this would have been the focus of publications and archival documents during the last 150 years.

From a Paleontological perspective, SAHRA paleosensitivity map as well as a desktop assessment commissioned for the project found that the study area is mainly underlain by Permian aged rocks of the Vryheid Formation, Ecca Group, Karoo Supergroup and Jurassic aged dolerite sills. The very high and high fossiliferous potential of the Ecca Group strata warrants an allocation of a High paleontological sensitivity to the areas underlain by the rocks of the Vryheid Formation. Dolerite is allocated Very Low Paleontological sensitivity.

5.4.5.2. LOCAL CONTEXT

A controlled exclusive heritage survey was conducted on the 19th of February 2015 and 14th of May 2015. This field survey focussed on the proposed temporary construction lay-down area, as the remainder of the proposed construction area fall inside previous disturbed construction areas associated with the first Overvaal tunnel construction. Further to this a palaeontological field assessment was completed by Dr Gideon Groenewald and Patricia Groenewald, experienced fieldworkers, of on Monday 11th of May 2015.

During the heritage study 9 heritage sites were identified of which will require further mitigation work if any construction activity are planned in their vicinity (Table 18).

TABLE 18: IDENTIFIED HERITAGE FEATURES (FOURIE; 2015).

Heritage Feature	Photo
OT01 Coordinates: E30.183112 S26.713715 Type: Cemetery Size: 20 x 20 meters Description: The site consists of approximately 9 graves, all stone packed and aligned east west. No headstones or any other indication of family affiliation was present. The site is situated within center of the northern temporary construction area adjacent to the N2.	
OT02 Coordinates: E30.199333 S26.717934 Type: Grave Size: 5 x 5 meters Description: Site OT02 consists of one probable grave. The structure's shape and east west alignment indicates that it is most probably a grave. It is situated on the edge of the temporary construction area demarcated at the southern exit point of the tunnel.	
Heritage features below will not be affected by the tunnel excavation, however proper mitigation measures should be implemented in order to avoid impacts of the proposed project related activities, (e.g. access roads, spoil stockpile areas, etc).	

Heritage Feature	Photo
OT03 Coordinates: E30.145750 S26.715762 Type: Cemetery Size: 50x30 meters Description: The cemetery is situated on the western boundary of Area 1, situated just south of the silos on the rail line. The sites consist of approximately 33 graves. The layout of the cemetery suggests possibly 3 families as two sets of grave are either fenced in or packed with a stonewall around. The earliest inscribed graves dated to 1911.	
OT04 Coordinates: E 30.167941 S -26.724382 Type: Barn Size: 30x30 meters Description: The site consist of the remains of a sandstone shed / barn situated 40 meters west of OT05, and is art of the larger farmstead associated with the area. The barn has no roof and is currently utilized as piggery by the current small scale farmer. The walls of the barn was constructed with sandstone block while the lintels for the doors and windows were of wooden beams.	

Heritage Feature	Photo
OT05 Coordinates: E 30.168291 S - 26.723452 Type: original farmhouse Size: 30x30 meters Description: The site consists of the remains of a sandstone ruin. The structure was most probably the original farmhouse. The house consisted of multiple rooms with wooden and stone lintels. The original flooring was wood	
OT06 Coordinates: E 30.167358 S26.722993 Type: workers cottages and cattle pens Size: 30x30 meters Description: The site consists of the remains of a sandstone ruin. The structure was most probably associated with additional cattle pens as well as laborers cottages.	
OT07 Coordinates: E 30.166806 S 26.722091 Type: shed/waenhuis Size: 30x30 meters Description: The site consists of the remains of a sandstone ruin known as a waenhuis (wagon garage). The structure consist of two parallel parts with the eastern section as the original waenhuis and the western section additional rooms that was utilized as storage space.	

Heritage Feature	Photo
OT08 Coordinates: E 30.168130 S 26.721139 Type: possible grave Size: 5 x 10 meters Description: The site consists of a possible grave. The alignment and general construction of the rocks present in the area indicates that at least one grave is present in this location.	
OT09 Coordinates: E 30.168501 S 26.720108 Type: cemetery Size: 10 x 10 meters Description: The site consists of 11 graves all aligned east west. Most have cement headstones with some also having a cement dressing.	

TABLE 19: PALAEONTOLOGICAL PHOTO RECORD OF EXPOSURES

Photo	Description	Picture
1	Western entrance to the existing tunnel. Note outcrop of dolerite sill at the level of the tunnel.	 Tunnel western entrance.
2	Dolerite sills underlying the development footprint of the tunnel. No fossils will be present in this unit.	 View of dolerite sills.

3	Sandstone and shale of the Vryheid Formation, overlying a dolerite sill at the western entrance to the tunnel.	 View of sandstone and shale of the Vryheid formation
4	Dark grey shale and overlying coarse-grained sandstone of the Vryheid Formation.	 Dark grey shale
5	Coarse-grained sandstone of the Vryheid Formation. No fossils were observed.	 Coarse-grained sandstone

6	Finely laminated, interbedded coarse-grained sandstone and thin dark-grey carbonaceous and micaceous shale of the Vryheid Formation. No fossils were observed.	 Finely laminated, interbedded coarse-grained sandstone and thin dark-grey carbonaceous and micaceous shale
7	Thin coal bed in dark grey to black carbonaceous shale of the Vryheid Formation. Plant fossils highly fragmentary and coalified, rich in places, but not exceptionally well defined.	 Thin coal bed
8	Plant fossils, well-defined, coalified and in some cases fragmentary. Fossils locally well-preserved, but limited to small outcrops.	 View of plant fossils

9	Interbedded coarse-grained sandstone and dark grey to black, carbonaceous shale and thin coal beds of the Vryheid Formation. Plant fossils fragmentary and associated with coal beds.	 View of coarse-grained sandstone and dark grey to black, carbonaceous shale and thin coal beds
10	Coarse-grained, cross-bedded sandstone of the Vryheid Formation. No fossils observed.	 Coarse-grained, cross-bedded sandstone
11	Coarse-grained sandstone with underlying black, carbonaceous shale of the Vryheid Formation. No fossils observed in the shale units.	 Coarse-grained sandstone

12	Deeply weathered sandy soil forming on the Vryheid Formation that underlies most of the surface area of the tunnel. No fossils observed	 Deeply weathered sandy soil
13	Access road to western entrance to the tunnel. Interbedded longshore sand bars and inter-channel shale's of the Vryheid Formation. Plant fossils are associated with carbonaceous shale and coal beds.	 Access road to tunnel western entrance
14	Interbedded sandstone and shale of the Vryheid Formation in western entrance railway cuttings to the tunnel. Plant fossils are associated with the black carbonaceous shale and coal beds.	 View of sandstone and shale

15	Regional setting of interbedded sandstone of extensive sand bars with interbedded carbonaceous shale of the Vryheid Formation. Plant fossils area associated with coal beds.	 View of sandstone of extensive sand bars with interbedded carbonaceous shale
16	Interbedded, finely laminated micaceous sandstone and grey-coloured siltstone, interbedded with coarse-grained sandstone of the Vryheid Formation. No plant fossils observed.	 View of micaceous sandstone and grey-coloured siltstone, interbedded with coarse-grained sandstone
17	Trace fossils (unidentified invertebrate burrows) in thinly bedded coarse-grained sandstone of the Vryheid Formation. These trace fossils are rare and recording of the presence of the fossils will be a significant contribution to our understanding of the palaeo-environments of this region.	

		View of trace fossils of the Vryheid Formation.
18	Surface entrance to the tunnel system. No outcrop of Vryheid Formation sandstone or shale in the area overlying the tunnel. No fossils observed.	 View of existing ventilation shaft
19	Eastern entrance to the tunnel system. Entire development will be in the dolerite dyke that underlies this part of the development. No fossils will be present in these rocks.	 Tunnel eastern entrance

5.5. Relevant Planning and Development Policies

Development in South Africa is broadly guided and directed by a wide range of legislation. In addition, local and provincial authorities have a number of policies and plans which guide development within the bounds of their specific jurisdiction. Three such policies are of particular importance for the Gert Sibande District Municipality (GSDM), namely:

- The National Spatial Development Perspective (NSDP);
- The Mpumalanga Provincial Growth and Development Strategy (MPGDS); and
- The Mpumalanga Rural Development Programme (MRDP).

Furthermore, a number of Planning Frameworks at District or Local Municipality level are of significant importance, namely:

- The Final Integrated Development Plan (IDP) for GSDM; and
- The Msukaligwa Local Municipality Integrated Waste Management Plan (IWMP).

This section provides a brief overview of the above-mentioned key planning and development policies for the GSDM and one of its local municipalities, MLM, in which the proposed project site is located. An overview of each of these planning and development policies and frameworks is presented, and aspects that are aligned (either positively or negatively) are highlighted.

5.5.1. NATIONAL SPATIAL DEVELOPMENT PERSPECTIVE (NSDP)

The National Spatial Development Perspective (NSDP) was initiated in 1999 with the purpose of not only providing strategic assessment of the spatial distribution and socio-economic characteristics of the South African population, but gaining a shared understanding of the distribution of economic activities and potential across the South African landscape. The NSDP currently delineates a number of guidelines for infrastructure investment in South Africa. The NSDP argues that government's social objectives will be best achieved through infrastructure investment in economically sustainable areas with proven development potential. Therefore, areas displaying little or no potential for growth should only be provided with the constitutionally mandated minimum levels of services, and the focus of government spending should rather be on the people (social development). Consistent with this philosophy, and given the need to reach and sustain an annual economic growth rate of 6% each year, the NSDP argues that resources and collaborative government action should be concentrated on maintaining and growing the economy in the 26 locations currently contributing 83% of the National GVA, of which the GSDM is part of.

However, of the local municipalities within GSDM, only Goven Mbeki Municipality is classified as having potential for high levels of economic activity. The NSDP classification for selected Municipalities in GSDM list MLM as an area of high levels of poverty concentration, as well as an area of combined poverty and economic activity. Furthermore, in terms of the Business Function Index in GSDM, only Volksrust is listed under the areas with high levels of formal local economic activity where there is a high dependence on the surrounding area for resource input.

The proposed project will provide an opportunity to contribute towards poverty alleviation through short term potential job creation during the construction phase of the proposed project. This would be in line with principles emanating from the broad philosophy and actions put forward by the NSDP, to guide development decisions whereby inequalities within the communities would be addressed by focusing on people and not places; and would be providing basic services, local transfer, and labour market information in areas with high levels of poverty and low development potential.

5.5.2. MPUMALANGA PROVINCIAL GROWTH AND DEVELOPMENT STRATEGY (MPGDS)

Another important government initiative implemented during the past few years is the PGDS programme. The PGDS was compiled with the parameters set by the NSDP, as well as the Sustainable Rural Development Strategy. The PGDS is aimed at providing strategic directives to District and Local Municipalities in formulating their more detailed IDP's and Spatial Development Frameworks (SDF's). The Mpumalanga PGDS was revised and adopted in 2008, and has identified six priority areas, namely:

- Economic Development (i.e. investment, job creation, business and tourism development);
- Infrastructure Development (i.e. urban/rural infrastructure, housing, and land reform);
- Human Resource Development (i.e. adequate education opportunities for all);
- Social Infrastructure (i.e. access to full social infrastructure);
- Environmental Development (i.e. protection of the environment and sustainable development); and
- Good Governance (i.e. effective and efficient public sector management and service delivery).

The above highlighted priority areas are in line with the proposed project, in terms of potential job creation during the construction phase of the proposed project, and in relation to the special care that needs to be taken when considering feasible alternatives.

5.5.3. MPUMALANGA RURAL DEVELOPMENT PROGRAMME (MRDP)

The Mpumalanga Rural Development Programme (MRDP) was established in 2001, and its main objective was to contribute towards an "improvement of the social and economic situation of the rural poor". The programme focuses on the creation of income and employment in rural areas, and its key concepts include:

- Self-reliance/empowerment (strengthen the self-help capabilities of the communities and emphasize development planning);
- Economic growth (encourage local economic development, employment, and income generation through promotion of small micro-sized rural enterprises and the participation of the private sector);
- Sustainability (improve viable and sustainable natural resource utilisation);
- Capacity building (strengthen, advise, and train service providers);
- Innovation (develop innovative concepts for public service delivery);
- Mainstream (get innovations on track);
- Coping with HIV/AIDS (plan, design, and implement relevant strategies in order to cope with HIV/AIDS); and
- Stakeholder participation (ensuring participation by all concerned).

It is important for the GSDM and its local municipalities, which includes the Msukaligwa Local Municipality within which the proposed project is to take place, to draw the concepts and principles of this plan down to local level, through spatial development policies and strategies.

The creation of jobs during construction could financially empower the local communities, as well as improve individuals' sense of self as a result of those previously unemployed being able to provide for themselves and their families. Moreover, through participating in the construction of the proposed project, and taking into account future developments likely to occur in the area, capacity in construction or other associated job opportunities would be cultivated which could facilitate economic growth within the Msukaligwa Local Municipality. Throughout the process of applying for authorization of the proposed project, public involvement has been and will continue to be a prominent factor. Furthermore, during the construction phase of the proposed project continuous communication with landowners in the affected areas will be expected/ mandated.

5.5.4. FINAL INTEGRATED DEVELOPMENT PLAN 2010/ 2011 FOR GERT SIBANDE DISTRICT MUNICIPALITY

According to the GSDM Municipal Manager, the IDP serves as a barometer both for GSDM and its citizens towards the realization of the District's development vision. A number of Key Strategic Focal Areas are identified by the GSDM Manager as important in making a significant impact towards improving the plight of the District's communities, these are: Municipal Transformation and Organization Development; Municipal Financial Viability and Management; Local Economic Development; Infrastructure Development and Service Delivery; Social Development and Community Services; and Intergovernmental Relations, Good Governance and Public Participation.

A number of the IDP priority issues and objectives for the GSDM have been identified to address the most pressing development challenges facing the District. Consequently, a number of the priority development issues and objectives stemming from the IDP process serve as development guidelines in the delineation of a SDF for the GSDM. These include:

- To accelerate the provision of, and to ensure that, all communities have access to clean water and decent sanitation infrastructure;
- To accelerate the provision of, and to ensure that, all communities have access to electricity services by;
- To accelerate the provision of, and to ensure that, all communities have access to better roads and stormwater infrastructure;
- To provide infrastructure that will create an environment that is conducive to economic growth and development;
- To provide infrastructure via using the approach of the Expanded Public Works Programme (EPWP), so as to halve unemployment by 2014;
- To accelerate the provision of quality health services that is affordable and accessible to all communities;
- To support the provision of comprehensive community facilities and services (school, clinics, etc.) to all communities where needed;
- To ensure that housing developments are located closer to places of work/economic opportunity;
- To provide comprehensive and effective disaster management, fire and emergency services to all communities;
- To ensure comprehensive transport planning in support of economic growth and development;
- To promote tourist attraction areas, and to increase the participation and beneficiation of the previously marginalised communities; and

- To ensure protection of the environment, through proper management of the proposed project construction activities.

5.5.5. INTEGRATED WASTE MANAGEMENT PLAN FOR MLM (PHASE 1)

Waste is a predictable consequence of development, and it must be managed in order to conserve natural resources and protect people and the environment. Waste is driven by three primary factors: the increasing production of goods; expanding population and a growing economy (DEAT, 2002). Due to increased population growth and urban and industrial development, there is an increased demand for waste service provision in terms of storage and collection facilities and services, handling and transportation, treatment and ultimately disposal services and facilities.

In South Africa, each Municipality is now required to prepare an Integrated Waste Management Plan (IWMP) as part of their Integrated Development Planning process. This requirement brings integrated waste management down to the local level, where it has the greatest potential to make an impact on our society and the environment.

The GSDM, with the financial assistance of the Development Bank (South Africa) Pty Ltd and the Mpumalanga Department of Land Affairs and Agriculture (DALA), initiated the development of a district IWMP, focusing on the general waste management services offered by the local municipalities within its area of jurisdiction.

The main objective of compiling an IWMP is to integrate and optimise waste management so that the efficiency of the waste management system is maximised, and the impacts and financial costs associated with waste management are minimised, thereby improving the quality of life of all South Africans. An IWMP must therefore provide a comprehensive overview of waste management planning.

The MLM IWMP (2011) report constitutes Phase 1 for the MLM. This report details the status quo or current situation of waste management within the MLM and looks at the existing waste management practices and systems which are currently being implemented within the municipal area, and their effectiveness. The objective of the status quo, or gap analysis, as the first phase in the development of an IWMP for GSDM, is to qualify and quantify all aspects related to current waste management services and practices carried out by the municipalities, with a view to using this information as a basis for future waste management planning. The IWMP report therefore includes a situational analysis of the various themes of solid waste management relevant to MLM and the GSDM e.g. the areas serviced, the waste management services rendered, their efficiency, cost effectiveness, social and environmental acceptability, etc. Specific objectives of the gap analysis phase, as outlined in the terms of reference for the proposed project, include:

- Obtain information on the current population of the area, growth estimates, densities and the population's socioeconomic categories and income levels;
- Identify and/or estimate the types and amounts of general waste generated in the municipal area, and the composition thereof;
- Describe and assess the existing waste management systems and practices;
- Determine the costs associated with providing the waste management services;
- Appraise the services in terms of quantity, quality, legal, social and environmental impacts and public acceptance.

From the above, shortcomings in service delivery are identified. These shortcomings are then used to develop the strategies and implementation plan for the IWMP. Recommendations relating to identified gaps in service delivery will be made and strategies to be developed will provide details of inter alia where the existing systems can be enhanced and improved upon and what additional systems and resources will be required to ensure that the entire municipal area is optimally covered in terms of waste management services.

During construction of the proposed project a large amount of waste (rock materials), particularly from the drilling and blasting process, will be produced. As outlined, National Environmental Management Act (Act 107 of 1998), the White Paper on integrated pollution and waste management (2000) and the National Waste Management Strategy (2011) all embrace the common goal of Integrated Waste Management, based on the principles of waste avoidance, waste minimization, reuse and recycling and responsible disposal. Waste management during construction must therefore, focus on the minimization and avoidance of waste generation at source, especially in the case of toxic or hazardous waste. All design options should first of all seek to reuse or recycle waste streams and where this is impossible seek to dispose of waste in a manner, which is least detrimental to the environment.

It is therefore recommended that the requirements of the MLM integrated waste management plan and other planning and development policies including those of GSDM be considered during construction, operation and decommissioning of the proposed project.

6. DESCRIPTION OF ALTERNATIVES

The identification of alternatives is a key aspect of the success of the EIA process. All reasonable and feasible alternatives must be identified and assessed to determine the most suitable alternatives for the proposed project. There are however some significant constraints that have to be taken into account when identifying alternatives for a project of this scope. Such constraints include financial, social and environment related issues. The following alternatives were assessed in detail in this EIAR:

- Process alternative: Waste handling options.
- Location alternative: Localised site alternatives and optimisation (proposed project and associated construction activities) – within a study area of 500m on either side of the preferred alignment.
- Technological alternatives: Drill and Blast and Tunnel Boring Machine.

For any alternative to be considered feasible such an alternative must meet the need and purposes of the development proposal without presenting significantly high associated impacts. As mentioned in Section 2 the need for the proposed project includes the following key drivers:

- The need to increase the current capacity of the coal line; and
- The need to reduce the risk associated with a single track bottleneck on the coal line.

For this reason, alternatives considered by the applicants' appointed engineering and technical team have been presented and assessed herein.

The remainder of this section briefly describes the alternatives which were considered feasible for this EIA and are comparatively assessed in Section 10.

6.1. Process Alternative

The EIA guideline published by the DEA uses the following examples to illustrate the nature of process alternatives: "the re-use of process water in an industrial plant, waste minimizing or energy efficient technology, or different mining methods". Process alternatives imply the investigation of alternative processes or technologies that can be used to achieve the same goal. This includes using environmentally friendly designs or materials, and reusing scarce resources like water and non-renewable energy sources.

Process alternatives have been defined and implemented as incremental alternatives during this EIA and presented in the EMPr. Specific process alternatives which will be considered in this EIAR include the following:

6.1.1. TUNNEL OPTIONS

The following alternatives relating to the design capacity of the proposed project are considered:

- *Construction of a second double track tunnel adjacent to the existing tunnel- preferred alternative*

This alternative is currently the preferred alternative and as such is presented in detail in Section 10 of this report. The doubling of the tunnel was considered to be the most feasible option based on various considerations, including: operations, costing and environmental impact (e.g. increase in coal export, efficient use of the railway line with no congestion, etc.). The tunnel will have to cater for a double track. From an operations perspective this option will have the greatest advantage as it follows more or less the same alignment as the current line and will thus have the shortest runtime of all the options reviewed.

Based on the feasibility study undertaken by the appointed engineers, comparison of the total cost between various identified options reveals the new double line tunnel-option as the most economical option with reduced operational, social and environmental challenges.

Construction of a double line tunnel is Transnet's preferred alternative which offers solutions to both current situation and future capacity challenges. This option is considered viable and it will be further considered during the EIA phase.

6.1.2. WASTE HANDLING AND PREFERED STOCKPILE AREAS

The construction of the proposed project will result in the generation and accumulation of significant quantities of waste rock and excavated materials (general waste as defined by the NEM: Waste Act, 59 of 2008). The following alternatives have been considered feasible for the proposed project:

- *Stockpile all rock waste removed from the tunnel excavation, undertake rehabilitation and blend with the surrounding environment.*

Prior to utilisation of the selected stockpile area, it is recommended that two small borrow pits that exist approximately 3500m to the east of the proposed project site be filled up with rock materials from excavation of the tunnel. The contractor should be responsible to ensure the waste is collected, stockpiled or disposed of properly and that appropriate measures are taken to minimise adverse impacts such as dust generation.

It is further noted that a small percentage of the excavated waste rock could be re-used by the construction processes (e.g. concrete, fill material, road building, etc). The option of re-use will be encouraged as far as possible.

6.2. Location Alternatives

Location alternatives relate to the main proposed project components (e.g. tunnel route) as well as the location of ancillary activities and structures (e.g. construction camps, stockpiling of rock material from drilling and blasting of the tunnel, laydown areas, staff accommodation, etc.).

6.2.1. TUNNEL ROUTE

At this stage the proposed project (tunnel route) is anticipated to be located approximately 20m south of the existing Overvaal tunnel (see Figure 8). The final route option for this proposed project will however be determined by the underlined geology, the acquisition of the required land, and other technical and environmental aspects. Specific route options which could be considered include:

- *Consideration of local route deviations (within close proximity to the existing tunnel) and options for ancillary activities, as a result of local technical and environmental sensitivities.*

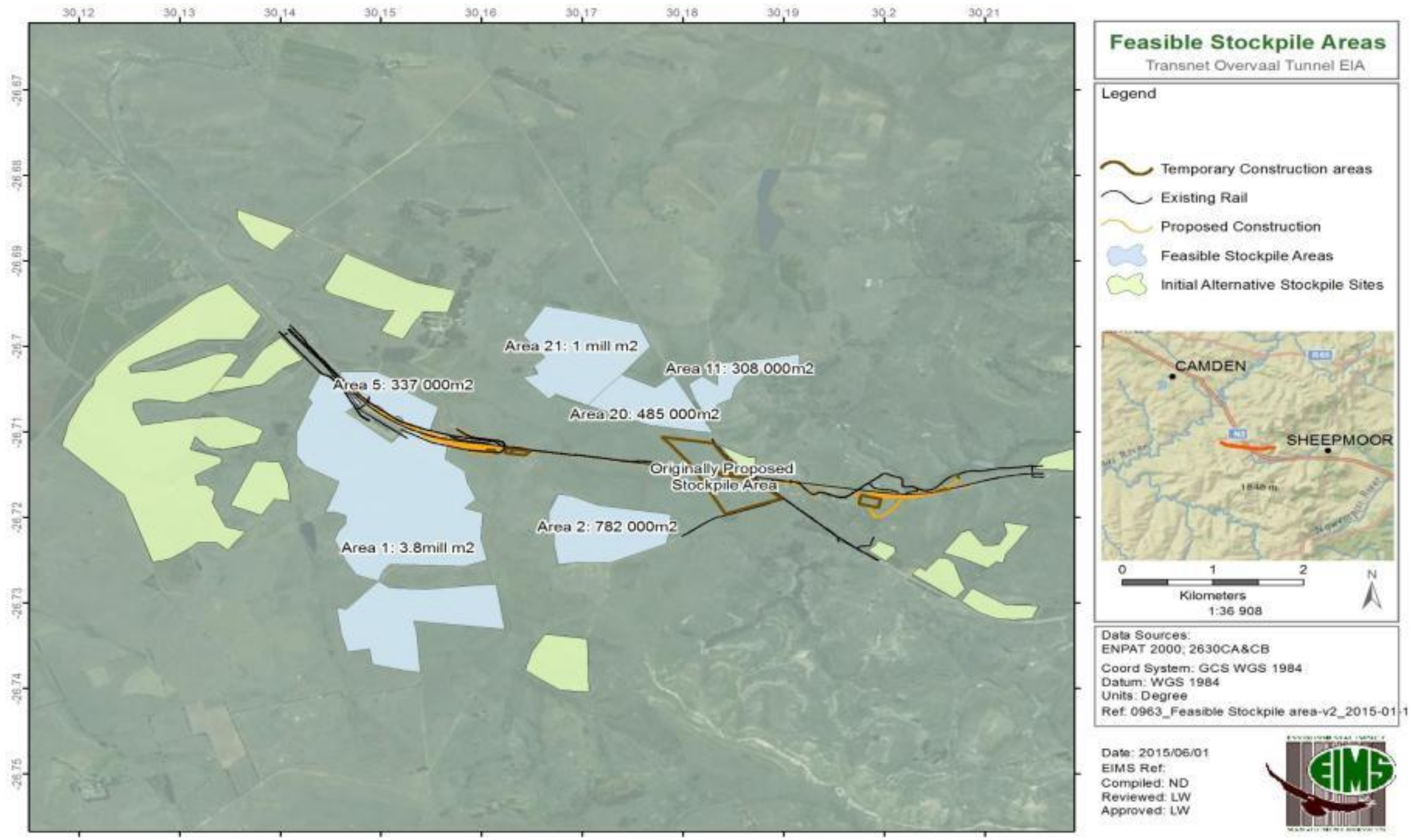

FIGURE 39: PROPOSED PROJECT FEASIBLE STOCKPILE AREA

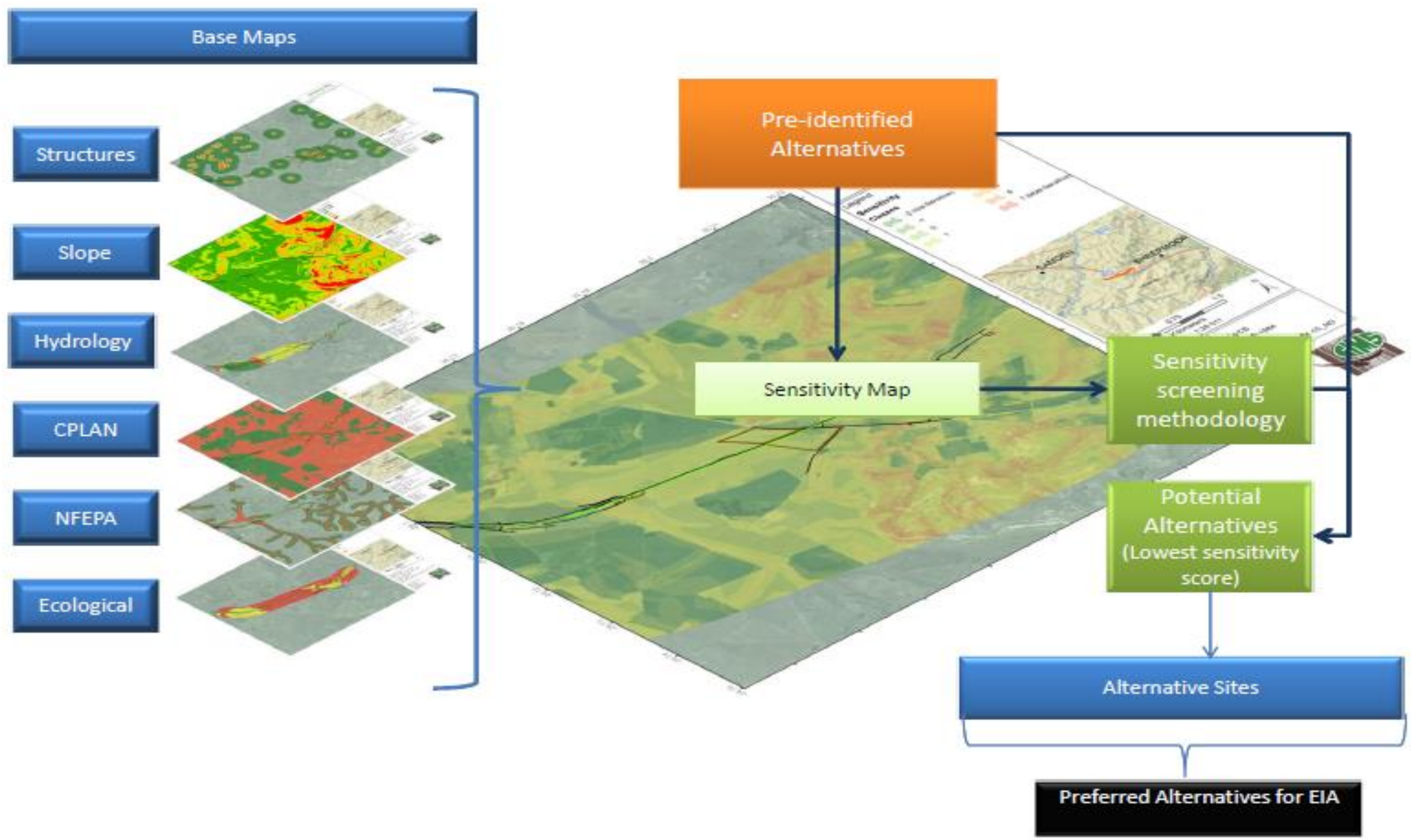

FIGURE 40: SENSITIVITY DIAGRAM

6.2.2. LOCALISED ALTERNATIVES

The location of the Contractor's site offices and camp sites will be subject to the approval of the Engineer. Proposed areas for the contractor's site camp are indicated on the attached project footprint layout, (see Appendix D). The contractor shall provide, erect, move and re-erect as necessary, maintain and remove at completion, ample temporary offices for the contractors own use.

This alternative also considers the following specific location options:

- The optimal location of the proposed waste rock stockpile, considering the relevant environmental sensitivities.
- The optimal location of activities associated with the construction works (e.g. temporary and permanent access roads, laydown areas, construction camps, etc).

In determining the preferred location alternatives a consolidated sensitivity approach has been followed (refer to Figure 39). A consolidated sensitivity map was prepared and the proposed locations of the various activities overlaid. This was then used to guide the localised positioning of the activities in such a way as to avoid sensitive environmental features, wherever possible.

6.3. Technological Alternative

Selection of the techniques to be adopted for construction of a tunnel section shall take into account the nature of the substrata and the levels of the tunnel involved. Technological alternative for this development will involve various options that can be considered for construction of the proposed project which include the following: use of a tunnel boring machine (TBM) or drill and blast.

6.3.1. USE OF A TUNNEL BORING MACHINE

Tunnel boring by way of a TBM is often used for excavating long tunnels. An effective TBM method requires the selection of appropriate equipment for different rock mass and geological conditions. The TBM may be suitable for excavating tunnels which contain competent rocks that can provide adequate geological stability for boring a long section tunnel without structural support.

6.3.2. DRILL AND BLAST

This tunnelling method involves the use of explosives. Drilling rigs are used to drill blast holes in the surface to a designated depth. Explosives and timed detonators (delay detonators) are then placed in the blast holes. Once blasting is carried out, waste rock and soils are transported out of the tunnel before blasting continues.

7. PUBLIC PARTICIPATION

Public participation can be defined as..."a process leading to a joint effort by stakeholders, technical specialists, the authorities and the proponent who work together to produce better decisions than if they had acted independently" (Greyling, 1999, p. 20). From this definition, it can be seen that the input of the public is regarded as very important indeed.

The Public Participation Process (PPP) is designed to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to assist them to:

- During the Scoping Phase:
  - Raise issues of concern and suggestions for enhanced benefits;
  - Verify that their issues have been recorded;
  - Assist in identifying reasonable alternatives; and
  - Provide relevant local information and knowledge to the environmental assessment.
- During the Environmental Impact Assessment (EIA) Phase:
  - Contribute relevant local information and knowledge to the environmental assessment;
  - Verify that their issues have been considered in the EIA process; and
  - Comment on the findings of the environmental assessments.
- During the decision-making phase:
  - Obtain information on the outcome, i.e. the competent authority's decision, and how and by when the decision can be appealed.

This Issues and Responses Report (IRR) lists all verbal and written issues raised by I&APs and stakeholders during the EIA process to date. A breakdown of the PPP is given within the remaining sections of this IRR.

7.1. Methodology

The PPP follows the requirements of Section 54 of GNR 543 and Section 41 of GNR 982 promulgated under the National Environmental Management Act (Act 107 of 1998).

7.1.1. Identification of Interested and Affected Parties

Key I&APs referred to in this report and the associated IRR include all identified key stakeholder groups (e.g. ward councillors, municipalities, government departments and NGOs). The Key I&APs were mostly pre-identified but some were registered during the site visits and at the initial public meetings.

There are various landowners in the vicinity of the proposed study area. In an effort to ensure that all potentially affected landowners are identified and included in this PPP, the contact details of all of the landowners within the study area were identified. Landowner contact details were obtained via the following processes:

- A Windeed search was conducted to obtain the contact details of the affected landowners, where available;
- Where the property was owned by a company, a CIPRO search was carried out to identify the owners and details; and

- Identified during site visits and at focus group and public meetings.

A few landowners belonging to the Bambanani - Sakhisizwe Communal Property Association requested to be registered during the initial site visit, and additionally at the focus group meeting.

The key I&APs identified for involvement in this process include, but not limited to, the following:

- Gert Sibande District Municipality;
- Msukaligwa Local Municipality;
- Ward Councillor (Ward11);
- Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs;
- Mpumalanga Department of Public Works, Roads, and Transport;
- Mpumalanga Department of Co-operative Governance and Traditional Affairs;
- Mpumalanga Department of Mineral Resources;
- Mpumalanga Department of Health and Social Development;
- Mpumalanga Department of Human Settlement;
- Mpumalanga Department of Labour;
- Mpumalanga Department of Water and Sanitation;
- Inkomati-Usuthu Catchment Management Agency;
- Vaal Catchment Management Agency;
- National Department of Water and Sanitation;
- National Department of Rural Development and Land Reform;
- National Department of Agriculture, Forestry and Fisheries;
- National Department of Provincial and Local Government;
- National Department of Mineral Resources;
- South African National Roads Agency; and
- South African Heritage Resources Agency.

Various Non-Government Organisations (NGO's), and other key stakeholders, were also contacted as follows: Mpumalanga African Farmers Union, National Union of Mine Workers, Agricultural Research Council, Agri Mpumalanga, AFGRI Operations, Mpumalanga Tourism and Parks Agency, Mpumalanga Wetland Forum, Earthlife

Africa, Endangered Wildlife Trust, Birdlife South Africa, Strauss Attorneys, Transnet, Chamber of Mines South Africa, WESSA, Eskom, Savannah South Africa, Minergy Limited, Mott Macdonald PDNA.

Please refer to the IRR for the full key I&APs and landowner databases (Appendix K).

7.1.2. Notices, Advertisements and Background Information Document

This section provides details on the notifications that were distributed as part of the process to date.

7.1.2.1. Initial Notification

Notification during the initial notification component of the PPP of this proposed project was undertaken as follows:

- Two advertisements (in English and Afrikaans) were placed in the Highveld Tribune newspaper on the 29th of October 2013;
- 30 x A2 size correx notices (10 in English, 10 in Afrikaans, and 10 in IsiSwati) were placed at key points in and around the proposed study area;
- A3 size posters (in English, Afrikaans, and IsiSwati) were placed at local public places;
- A Background Information Document (BID) was prepared, distributed, and made available on the EIMS website, for registered Interested and Affected Parties (I&APs);
- A4 pamphlets (in English, Afrikaans and IsiSwati) and BIDs (in English) were distributed to local landowners and land occupiers within the proposed study area;
- Notification letters, faxes and/or emails were distributed to all pre-identified Key I&APs such as government organisations, NGOs, ward councillors, district and local municipalities and other organisations that might be affected; and
- As many affected landowners as possible were identified and written notification and BIDs were distributed to them.

The notices, adverts and written notification afforded I&APs the opportunity to submit their issues/queries/concerns to EIMS, and the EIMS contact person, contact number, email and fax details were clearly stated on these notifications. Comments/concerns and queries were encouraged to be submitted in either of the following manners:

- Electronically (fax, email)
- Telephonically, or
- Written letters.

All comments received by EIMS are submitted to the competent authorities for consideration and decision making.

7.1.2.2. Draft Scoping Report Notification

Notification regarding the availability of the Draft Scoping Report (DSR), a component of the PPP, was given in the following manner:

- Notification letters (English, Afrikaans and isiZulu), faxes, and/or emails were distributed to all I&APs (pre-identified key I&APs as well as I&APs registered during the initial notification period; and
- All affected landowners within the study area boundary were notified.

Written notification afforded all I&APs the opportunity to submit their issues/queries/concerns on the Proposed Development and the content of the DSR. The contact person, contact number, email and faxes were clearly stated on the distributed notifications. I&APs were encouraged to submit their comments/concerns and queries in either of the following manners:

- Electronically (fax, email);
- Telephonically; and/or
- Written letters.

Copies of the DSR were made available at public venues and online for perusal and comment by all I&APs.

7.1.2.3. Final Scoping Report Notification

Notification regarding the availability of the Final Scoping Report (FSR), a component of the PPP, was given in the same manner as for the Draft Scoping Report above.

The FSR was made available to the public online (EIMS website) for perusal and comment by all I&APs. Comments received from I&APs to date are included in this IRR to be submitted to the DEA for consideration towards the decision making as part of the Draft EIA Report submission.

7.1.2.4. Public and Focus Group Meeting Notifications

Two initial public meetings were held on the 14th of November 2013, and two further Scoping phase public meetings held on the 28th January 2015. Notification regarding the scheduled public meetings was given as part of the Initial & DSR availability notifications, as follows:

- Notification letters (English, Afrikaans and isiZulu), faxes, and/or emails were distributed to all I&APs (pre-identified key I&APs, as well as I&APs registered during the initial notification period; and
- Notification letters, faxes and/or emails to all affected landowners within the study area boundary were notified.

Invitations for a focus group meetings, on the 13th November 2013 and on the 27th January 2015, were extended to the Bambanani - Sakhisizwe community. The invitations were undertaken telephonically through a representative of the community Mr Jacob Ndinisa, as the community does not have access to facsimile and email facilities.

7.1.3. Focus Group Meetings

During the initial notification period of the proposed project, a focus group meeting was arranged with landowners of the Bambanani - Sakhisizwe Communal Property Association on the 13th November 2013, prior to the initial public meetings held on the 14th November 2013. The focus group meeting was held in Maviristad at the Bambanani - Sakhisizwe community representative's premises. The concerns, queries, comments and suggestions raised by the attendees of the focus group meeting were recorded and included in minutes of the said meeting, and are included in IRR.

During the review period of the DSR, an invitation for another focus group meeting was extended to the Bambanani -Sakhisizwe community which was subsequently accepted. The focus group meeting took place at the Bambanani Sakhisizwe community representative's premises on the 27thJanuary 2015, prior to the public meetings scheduled for the 28th January 2015. The findings of the DSR were presented followed by an opportunity for the attendees to raise their comments, concerns, and/or queries regarding the presentation and the proposed project. The attendees were further given the opportunity to discuss outstanding matters from the initial focus group meeting. All comments, queries and/or concerns were recorded and are presented in the minutes as part of the IRR.

7.1.4. Public Meetings

During the initial notification period of the proposed project, two public meetings were held on the 14th November 2013. The first initial public meeting was held at the Overvaal Guesthouse from 10h00 until 12h00 and the second meeting was held at the B. Maseko Primary School Hall in Sheepmoor from 14h00 until 16h00. During the initial public meetings, numerous comments, concerns and queries were expressed and these were recorded in the minutes and the IRR.

Furthermore, during the review period of the DSR, two public meetings were conducted on the 28th January 2015. The first DSR public meeting took place at the Overvaal Guesthouse between 10h00 and 12h00, an the second meeting was held at the Sheepmoor Community Hall between 13h00 and 15h00. During the public meetings, the findings of the DSR were presented prior to opening the floor for comments, concerns and/or queries. The comments, concerns and queries received at these meetings included in the IRR submitted with this EIA Report.

7.1.5. Document Review

In accordance with the requirements of Regulation 56 of GN R. 543, the I&APs were afforded the opportunity to comment on the DSR and FSR submitted to the DEA. In this regard the following was conducted:

- Letters, Faxes, and/or emails were sent to all registered I&APs inviting them to comment on the DSR and FSR;
- The DSR was made available to the I&APs at the Ermelo Library and the Sheepmoor Municipal Office for a period of 40 days; and
- The DSR and FSR were also placed on the EIMS website for review.

7.2. Summary Of Responses From I&Aps

The I&APs were provided with various mediums through which they could provide comment: namely through facsimile, telephone, email and post. All such correspondence with the I&APs has been recorded and incorporated into the IRR throughout the Scoping and EIA Phases. The issues and concerns identified in the public participation process to date, include the following categories:

- Registration/ participation;
- Eskom specific issues;
- Fauna;
- Acknowledgement of initial notification;
- Requests for information;
- Employment issues;
- Property/ land issues;
- Safety and security concerns;
- Water issues;
- Impact on existing infrastructure;
- Compensation;
- Skills development;
- Waste management;
- Community benefits;
- Health and safety;
- Dust pollution;
- Palaeontology and heritage;
- Acknowledgement of Draft Scoping Report notification;
- Meeting arrangements; and
- General issues.

The concerns raised during the Scoping phase focus group and public meetings as well as through continued correspondence with I&APs to date is presented in the IRR and the associated meeting minutes. All comments, queries, concerns received thus far have been responded to as per the contents of the IRR and meeting minutes.

7.3. Authority Consultation

The following steps have been undertaken to ensure authority consultation:

- The DEA was provided with a copy of the DSR as well as other relevant organs of state and authorities as commenting authorities during the public review period;
- The FSR was submitted to the DEA for review and decision making; and
- DEA accepted the FSR on the 17th of April 2015.

The Draft EIA Report and Environmental Management Programme (EMPr) has been made available from the 22nd June to the 31st July 2015 to the public for review and comment, as well as submitted to the competent authority and other commenting authorities for their input. The Draft EIA Report will be updated based on the public review correspondence as well as any input from the commenting authorities. The Final EIA Report and EMPr will be submitted to the competent authority for decision making, and will also be made available on the EIMS website to all registered I&APs for review.

The competent authority will subsequently make a decision on whether to issue an Environmental Authorisation (EA) or not. It is a requirement that all registered I&APs are informed of the decision and provided the opportunity to appeal.

In addition to the DEA, a pre-application meeting, in expectation of submitting a WUL application, was held with the DWS on the 15th of May 2015, (refer Appendix L for the copy of minutes).

The following opportunities for further consultation and notification will be afforded during the EIA phase:

- The Draft EIR will be made available for a period of 40 days in the same manner as the Draft scoping report (refer to Section 5);
- The final EIR will also be made available on the EIMS website for public review; and
- During the review period of the Draft EIR, two public meetings will be undertaken. Public meetings will be held at the Overvaal Guest House and the Sheepmoor community hall.

8. SUMMARY OF SPECIALIST INVESTIGATIONS

Numerous specialist studies were conducted during this EIA. These included the following fields of study:

- Ecological Impact Assessment;
- Hydrological and Geohydrological Impact Assessment;
- Wetland Impact Assessment;
- Heritage Impact Assessment;
- Noise and Vibration Impact Assessment; and
- Paleontological Impact Assessment

The final output was an Impact Assessment Report specific to the field of expertise. A brief summary of the key findings of each of the EIA phase specialists' impact assessments is provided below. Various aspects of these specialists' reports are included in the different sections of this draft EIAR and the full reports are appended.

8.1. Hydrological and geohydrological Impact Assessment

8.1.1. HYDROLOGICAL IMPACT ASSESSMENT

The Hydrological Impact Assessment was part of the EIA Phase investigations undertaken by GCS Water and Environmental Consultants, for inclusion in the overall EIAR and EMPr for the Proposed New Overvaal Tunnel (see Appendix G for full report).

A desktop evaluation of the streams within the study area was carried out to determine which of the streams would be impacted on by the proposed development of the railway line. Thereafter five water quality sampling locations were determined. During the site visit the proposed water quality sample locations were visited. Samples are taken from streams where flow is present; upon inspection of the sample locations it was found that stream flow was only present at sample Transnet WQ 4. It is suspected that this flow is generated from the groundwater ingress into the Overvaal Tunnel, this water then flows into the stream adjacent to the tunnel.

Baseline water quality analyses derived from sample (Transnet WQ 4) taken during the site visit indicate good water quality, all tested parameters are below the set guideline and standard limits. It must be noted that only one sample was taken and that these results only act as a snapshot of the water quality in the stream. It is therefore recommended that a monthly monitoring programme be setup to monitor the in-stream water quality.

The South African National Water Act (36 of 1998) guides the minimum requirements for placement of infrastructure in relation to a natural watercourse. This legislation stipulates that no infrastructure is allowed to be placed and constructed within the 1:100-year flood line from the river in question. Four streams were identified to be within the proposed area of interest and therefore the flood lines were determined for these streams. The flood levels for the 1:50-year and 1:100-year flood peaks were determined and plotted the results from the analysis show that the construction area at the eastern entrance of the tunnel is within the 1 in 100 yr flood line extents. Therefore this proposed would have to be relocated to outside of the 1 in 100 yr flood line extents.

There is a potential for impacts to water quality of water resources during the project as a result of the following key impacting processes:

- An increase in suspended sediments due to removal of vegetation and the disturbance catchment areas; and
- The release of toxicants (oils, greases and other chemicals) by machinery or the failure to adhere to EMPr measures. Coal will be transported by the rail passing through the proposed new tunnel and may be classified as a hazardous material if it were to contaminate surrounding soil and water.

The results of the impact analysis highlight that with the appropriate environmental management procedures all risks can be mitigated to a low risk.

The Storm Water management Plan (SWMP) was developed in accordance with the General Notice 704 (GN704) legislation of the National Water Act (NWA) (Act 36 of 1988), this legislation is however not applicable to the project as no mining activities will be undertaken. However the principles of the act were taken into consideration as GN 704 makes provision for the following:

- Confinement of any unpolluted water to a clean water system away from possible contamination;
- Collection of water arising within dirty water areas into a dirty water system; and
- Sizing of both the clean and dirty water systems so that they convey the 1 in 50 year flood peak.

The SWMP will be comprised of approximately 4.9 kilometres of clean and dirty water channels and 4 proposed dirty water collection sumps. The surface water runoff generated from the dirty water catchments (means any area which is likely to cause pollution of a water resource) will be diverted to the proposed dirty water collection sumps where it will be contained for re-use or treatment.

8.1.2. HYDROGEOLOGICAL IMPACT ASSESSMENT

The Hydrogeological Impact Assessment was part of the EIA Phase investigations undertaken by GCS Water and Environmental Consultants, for inclusion in the overall EIAR and EMPr for the Proposed New Overvaal Tunnel (see Appendix G for full report).

Scoping Phase:

GCS conducted a hydrocensus survey within a 2km radius of the proposed tunnel, where 18 sensitive groundwater receptors were identified. Of the 18, eight of these were groundwater abstraction boreholes, nine were natural springs and one was a decanting exploration borehole. Based on the groundwater level data, the general groundwater flow direction is from the west (Highveld Plateau) towards the east. Two types of aquifers exist underlying the project area namely:

1. Shallow unconfined weathered aquifer, within the Quaternary sediments, weathered Karoo and Dolerite formations; and
2. Deeper confined to semi-confined fractured bedrock aquifer, within the fresh but fractured Karoo and Dolerite bedrock.

The groundwater levels support that these two aquifers are mainly independent from each other, but connectivity might exist near the existing tunnel portal areas due to the drill and blasting method used to construct the existing tunnel.

In total, six groundwater samples were collected for chemical analysis. These results revealed that the general groundwater quality of the weathered aquifer falls within the ranges recommended by the South African National

Standard (SANS 241:2011) except for the elevated manganese and iron concentrations. The groundwater quality of the deeper fractured bedrock aquifer falls completely within the ranges recommended by the SANS and is suitable for human consumption.

Evaluation Phase:

A conceptual understanding of the hydrogeological conditions underlying the project area has been formulated to describe the site specific hydrogeological cycle and how it will be impacted by the new tunnel development. Groundwater recharge mainly occurs through rainfall infiltration in low laying areas and wetlands situated on the Highveld plateau. The rainfall infiltrates and recharges the shallow weathered aquifer, the weathered aquifer would in turn seep into the deeper fractured bedrock aquifer through the extensive fracture networks and open faults.

Areas with high joint densities correlates to areas with lower groundwater levels within the existing tunnel area at specific tunnel segments (C2, C6, C9, C11 and C13) and are most likely as a result of the hydraulic connectivity between joint networks and the exiting tunnel.

For the purpose of this investigation, a Steady State Analytical Model was utilised to calculate the total potential tunnel inflow of 124m^3/day (1.44l/sec), which falls within range compared to 120m^3/day based on the Aurecon Interpretive Hydrogeological Report (nr. 3425089.001S-RPT-0053). This inflows would only be encountered when all tunnel sections are open simultaneously and tunnel walls were ungrouted, but this scenario would not be likely to occur as tunnelling construction progressively takes place, water bearing fractures will be sealed off before tunnelling proceed.

An average radius of influence of 290m was calculated compared to the maximum radius of influence of 306m based on Aurecon Interpretive Hydrogeological Report. The dewatering effect of the proposed tunnel will mainly be limited to the fractured bedrock aquifer and around the weathered aquifer around the tunnel portal areas.

Risk Assessment Phase:

Both the weathered and fractured aquifers underlying the project area are classified as a Minor Aquifer Systems, based on Parsons 1995 Aquifer Classification System. Although these minor aquifers seldom produce large quantities of water, they are important for both local water supplies and in supplying base flow for rivers, streams and springs.

Eight (8) receptors are located in close proximity to the proposed tunnel, highwall excavation areas and proposed materials stockpile areas. These eight are:

- OHP7 and OHP8 - Bambanani-Sakhisiztwe Community groundwater abstraction boreholes;
- OHP9 - AFGRI Operations groundwater abstraction borehole;
- OHP12 - Mr. AJ van der Meulen's farm groundwater abstraction borehole; and

- OHP5, OHP10, OHP11, and OHP18 - Natural springs located at the Overvaal tunnel portal and surrounding wetlands.

Based on the results of the regional and local assessment, it was determined that the original spoil sites/ stockpile areas, would have impacted negatively on both regional and local high sensitive vegetation and habitat. Subsequently six other sites had been identified and evaluated through a site visit in May 2015 and subsequent desktop analysis. Six (6) alternative stockpile areas (also referred to as spoil sites) have been selected for site comparison analysis based on their hydrogeological suitability / favourability for a stockpile area. The six stockpile areas are ranked on the basis of hydrogeological aspects, in a descending order to its suitability / favourability for a stockpile area:

Ranking:	Site Alternative:		Suitability / Favourability:
1.	Site 1 & 11 combined	=	Favourable (Suitable)
2.	Only Site 1	=	Favourable (Suitable)
3.	Only Site 2	=	Favourable (Suitable)
4.	Site 5 & 11 combined	=	Less Favourable (Less Suitable)
5.	Site 21	=	Unfavourable (Unsuitable)
6.	Site 20	=	Unfavourable (Unsuitable)
7.	Original Stockpile Area	=	Unfavourable (Unsuitable)

The Impact Risk Matrix was compiled based on EIMS's Impact Assessment Methodology for the construction, operation and decommissioning phases of the project. It was concluded that potential groundwater impacts upon the groundwater aquifer and nearby groundwater abstraction boreholes exist, in terms of lowering of groundwater levels, groundwater and spring water contamination, spring flow rate and borehole yield reductions, as a result of the following key impacting processes:

- Physical construction method (drilling and blasting) of the tunnel;
- Lowering of groundwater levels by the tunnels dewatering effect;
- Stockpiling of carbonaceous shale or coal material on the material stockpile area/s;
- The physical location of the material stockpile area in terms of its hydrogeological suitability for a stockpiling area/s.
- The release of chemicals and toxicants (oils, fuel, greases and other chemicals) by heavy machinery or the failure to adhere to EMPr measures; and
- Coal debris that have fallen off the train wagons during transport when using the proposed new tunnel and may be classified as a hazardous material if it were to contaminate surrounding soils and water resources.

8.2. Ecological IMpact Assessment

Ecological survey was conducted by EkoInfo cc and Associates, (see Appendix F for full ecological report).The study was approached from a desktop and literature review approach, field observations over a three day period in February 2015 and supplemented by a further field visit in May 2015. For the purpose of this document, the study area was divided in to a western and eastern section in terms of the N2 freeway, with almost two-thirds of the study area located within the western section.

8.2.1. FLORA COMPONENT

It was determined that on a regional scale, the study area transects the vulnerable Eastern Highveld Grassland and the least concern Wakkerstroom Montane Grassland. The transitional location was also confirmed on a regional/ landscape and local level. The following two vegetation communities and four sub communities were identified based on the observations of 15 Braun-Blanquet plots:

1. *Hyparrhenia hirta - Eragrostis curvula* tall disturbed grassland on well-drained, medium textured, moderate deep soils associated with medium slopes

    1.1. *Helichrysum nudifolium - Hyparrhenia hirta - Eragrostis curvula* tall disturbed grassland

    1.2. *Helichrysum rugulosum - Hyparrhenia hirta - Eragrostis curvula* tall disturbed grassland

2. *Helichrysum aureonitens - Eragrostis plana* tall climax grassland on moist, coarse textured, deep soils associated with flat slopes

    2.1. *Satyrium longicauda - Helichrysum aureonitens - Eragrostis plana* tall climax grassland

    2.2. *Arundinella nepalensis - Helichrysum aureonitens - Eragrostis plana* tall climax grassland

The presences of ten provincially protected species had been confirmed, as well as the habitat suitability of at least one threatened Red Data plant, *Gladiolus malvinus*.

8.2.2. FAUNA COMPONENT

The study area includes the usual variations of faunal habitat found throughout most of the Mesic Highveld Grassland Bioregion (pers. obs.). Disturbed primary vegetation, secondary vegetation and transformed areas are commonly found commonly in the southern parts of Mpumalanga. Crop agriculture, opencast coal mining and associated infrastructures in the region have seen the destruction of significant areas of the grasslands of southern Mpumalanga. However, the study area does include significant fragments of pristine grassland and associated wetlands. These fragments of pristine grasslands are not common in the landscape, and are becoming fewer as the pressures of a growing human population increase. The climax grassland fragments of the study area are of very good ecological quality, are biodiverse, are well linked to larger areas of primary grassland, and have very good Red Data Species hosting abilities. Despite the small size of the study area, a good representation of grassland animals were encountered during the field investigation; this included the Vulnerable Secretary bird.

Based on the ecological qualities and diversities of the study area (mostly of the primary vegetation fragments), it is estimated that fifteen other Red Data animals of Mpumalanga are highly likely to occur in the study area. These animals include six species listed as Data Deficient, four species listed as Near Threatened, four species listed as Vulnerable and one species, the Grey Crowned Crane, *Balearica regulorum* (E.T. Bennett, 1834), listed as Endangered. All results obtained during this assessment supports the estimated high sensitivity of the pristine primary vegetation faunal habitat fragments located within the study area's boundaries. It is proposed that the areas designated to have high faunal sensitivities (pristine primary vegetation) should be excluded from any activities and associated impacts during the construction and operational phases of the proposed project.

Based on the results from the flora and fauna components, it was determined that the remaining vegetation/ habitat on the eastern section is of moderate total ecological sensitivity and the remaining vegetation/ habitat on the western section of high total ecological sensitivity. It is therefore strongly recommended that the high total ecological sensitivity areas should be avoided, with the placement of the development footprint and associated infrastructure in already transformed/ disturbed areas of very low, low and moderate total ecological sensitivity.

8.2.3. ADDITIONAL SPOIL SITE ASSESSMENT

Based on the results of the regional and local assessment, it was determined that the original spoil sites/ stockpile areas, would have impacted negatively on both regional and local high sensitive vegetation and habitat. Subsequently six other sites had been identified and evaluated through a site visit in May 2015 and subsequent desktop analysis. During the site visit and data analysis the historical and current human influenced status of these six areas were confirmed, which made them suitable candidates for the placement of the spoils. Those sites which did not contain any currently cultivated land or very little cultivated land were considered more suitable for the placement of the spoils as it would prevent/ reduced the need to duplicate the lost cultivated land somewhere else in the landscape. Therefore the cumulative impact of using these sites is reduced further. The more suitable sites in order of preference are: area 2, area 20 and area 11.

In addition, areas were indicated by a local landowner, which were impacted upon by the original tunnel construction activities, these areas cover approximately 14 hectares, and should also be considered as it would keep impacts on impacts, which translates into international environmental best practise.

8.2.4. ENVIRONMENTAL IMPACT ASSESSMENT

The identification of the historically human influenced areas for the placement of the spoils has reduced the impact on the natural vegetation significantly, thereby conserving actual and potential habitat of species of concern.

The following impacts are considered to be relevant during the life cycle/ phases of the proposed project:

1. ***Planning Phase***
   - Transformation of natural vegetation/ habitat
   - Destruction of species of concern (Red Data, protected) or suitable habitat for them

2. ***Construction Phase***

- Harvesting of medicinal plants or poaching of bushmeat
- Off road driving beyond the development footprint
- Control of alien invasive species

3. ***Operational Phase***

- Control of alien invasive species

4. ***Decommissioning Phase***

- Re-establishment of regionally indigenous species in rehabilitated areas
- Control of alien invasive species

In terms of this proposed project, it is concluded that the movement of the spoil areas to either historically or currently transformed areas, had a significant influence on reducing the impact of this proposed project on the local vegetation and the immediate landscape. Taking in consideration this positive step towards addressing habitat loss and fragmentation, the other impacts associated with the proposed project can be effectively mitigated as long as the relevant Environmental Management Programme is implemented effectively, thereby resulting in a low negative impact on a local scale.

8.3. Heritage Impact Assessment

The Heritage Impact Assessment was part of the EIA Phase investigations undertaken for inclusion in the overall EIAR and EMPr for the Proposed New Overvaal Tunnel (see Appendix I for full report).

A controlled heritage exclusive survey was conducted on the 19th of February 2015, by PGS Heritage (Pty) Ltd. This field survey focussed on the proposed temporary construction lay-down areas, as the remainder of the proposed construction area falls inside previous disturbed construction areas associated with the first Overvaal tunnel construction. During the heritage study 9 heritage sites were identified of which all will require further mitigation work dependant on the site selection process for the stockpiles area.

8.3.1. CEMETERIES AND POSSIBLE GRAVES

Site OT01

The site consists of approximately 9 graves, all stone packed and aligned east west. No headstones or any other indication of family affiliation was present. The site is situated within the centre of the original stockpile area, adjacent to the N2.

Site OT02

Site OT02 consists of one probable grave. The structure's shape and east west alignment indicates that it is most probably a grave. It is situated on the edge of the temporary construction area demarcated at the southern exit point of the tunnel.

Site OT03

The cemetery is situated on the western boundary of Area 1, situated just south of the silos on the rail line. The site consists of approximately 33 graves.

Site OT08

The site consists of a possible grave and is situated on the western boundary of Stockpile Area 2. The alignment and general construction of the rocks present in the area indicates that at least one grave is present in this location.

Site OT09

The site consists of 11 graves all aligned east west and is situated on the western boundary of Stockpile Area 2. Most have cement headstones with some also having a cement dressing.

8.4. Palaeontology

The predicted paleontological impact of the development is based on the initial mapping assessment and literature reviews as well as information gathered during the field investigation. The field investigation confirms that the study area is underlain by coarse-grained sandstone and dark grey to black-coloured carbonaceous shale and thin coal beds of the Vryheid Formation of the Ecca Group and a Dolerite sill of the Karoo Supergroup.

The excavations for the extension of the western entrance to the tunnel will be into sediments of the Vryheid Formation. The plant fossils are in most cases highly fragmentary and coalified, leading to a lowering of the significance values for these fossils. The trace fossils found in the thinly interbedded sandstone are highly significant, but extremely rare. Medium Palaeontological sensitivity is therefore allocated to this section of the development.

8.4.1. IMPACT RATING

The overall impact on heritage resources is seen as low with the implementation of the recommended mitigation measures.

8.4.2. STOCKPILE SITE PREFERENCES

The following table indicates the Stockpile sites provided for analysis and assessment according to their preference based on the impact foreseen on heritage resources (please refer to Appendix E for the map showing stockpile options).

TABLE 20: HERITAGE SPECIALIST PREFERENCE LISTING OF STOCKPILE AREAS

Site name	Preference	Rating
Original stockpile	**Preferred**	**1**
Area 1	**Preferred**	**1**
Area 2	**Not preferred**	**3**
Area 5	**Preferred**	**1**
Area 20	**Preferred**	**1**
Area 21	**Preferred**	**1**
Area 11	**Preferred**	**1**

8.5. Noise and Vibration Impact Assessment

8.5.1. NOISE IMPACT ASSESSMENT

The Noise Impact Assessment was as well part of the EIA Phase investigations undertaken for inclusion in the overall EIAR and EMPr for the Proposed New Overvaal Tunnel. A survey was conducted by Sound Research Laboratories South Africa (Pty), (see Appendix J for full noise report).

Transnet is currently assessing whether to use drill and blast methods or a Tunnel Boring Machine for the tunnel excavation. This report assesses these two methods, and the associated hauling of spoil, and earthworks, as well as the construction of the new rail lines in the new tunnel.

The assessment shows that construction noise at all Noise Sensitive Areas has an Environmental Significance Rating of “Low” i.e. where this impact would not have a direct influence on the decision to develop in the area. Operational noise will likely decrease slightly, which has a positive / beneficial Environmental Significance rating of “Low”.

The contractor must use the recommendations in BS 5228:2009 Part 1 to control the levels of noise created on site during the construction phase. This is the recognised standard to use for this purpose; there is no local equivalent standard.

8.5.2. VIBRATION IMPACT ASSESSMENT

Sound Research Laboratories South Africa (Pty) Ltd has been commissioned to undertake a specialist study to assess the vibration impact of the proposed new Transnet rail tunnel at Overvaal, Mpumalanga, (see Appendix J for full vibration report). Due to the rural nature of the site, buildings are sparsely distributed. There are very few buildings close to the site. The following have been identified by the specialist in the immediate vicinity of the site:

- Farmhouse with guesthouse,
- Grain silos, and

- Rural residential dwellings.

The assessment shows that construction vibration (both blasting and tunnel boring) has an Environmental Significance Rating of "Low" i.e. where this impact would not have a direct influence on the decision to develop in the area.

Transnet must:

- Arrange with a qualified engineer to inspect all of the buildings at the VSAs before and after the construction period. Should damage occur, an independent assessor needs to be appointed in order to evaluate the damage and determine compensation.
- Continuously inspect the N2 freeway above the tunnel while the tunnel is being dug underneath the road.
- Install vibration monitoring equipment at the AFGRI grain silo and rural farmstead VSA 2
    - Use this equipment to check that the vibration limits are not exceeded while the charge size is increased to the contractor's intended size
    - Continue to monitor blast vibration levels until construction is completed

8.6. Wetland Impact Assessment

Imperata Consulting CC has been commissioned to undertake a Wetland Impact Assessment for the proposed new Transnet rail tunnel at Overvaal, Mpumalanga, (see Appendix H for full wetland report).

- Investigated watercourses were defined by definitions specified in the National Water Act, 1998 (NWA), Act No. 36 of 1998:
    - A river or spring.
    - A natural channel in which water flows regularly or intermittently.
    - A wetland, lake or dam into which, or from which, water flows.

Wetlands and riparian habitat were delineated based on the delineation method developed by the Department of Water & Sanitation (DWAF, 2005). Wetlands present within the study area were classified up to a hydro-geomorphic (HGM) level based on the method developed by Ollis *et al.* (2013).The Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of delineated watercourses within the study area were assessed through methods developed by the Department of Water and Sanitation (DWAF 1999a; DWAF 1999b; Rountree & Malan, 2010).

The study focused on proposed development footprints within the study area, while surrounding areas i the study area were mainly assessed at a desktop level with limited sampling. Site surveys were undertaken from 18–20 February, 14–15 May and 25 May 2015. The study area is located within two Water Management Areas (WMA), the Overvaal WMA is located in the western portion of the site (west of the N2 Highway), while the Usutu to Mhlatuze WMA is located mainly east of the N2 Highway. The study area overlaps with listed Threatened Ecosystem areas according to the 2011 Schedule (Government Gazette of December 2011) of the Biodiversity Act (Act 10 of 2004), namely Chrissiesmeer Panveld (MP 3) and Eastern Highveld Grassland (GM 12). Both are mainly restricted to the western Upper Vaal WMA section of the study area. The Chrissiesmeer Panveld Threatened Ecosystem has an Endangered conservation status, while the Eastern Highveld Grassland Threatened Ecosystem has a vulnerable conservation status. Information from the Mpumalanga Biodiversity Sector Plan (MBSP) of 2013 indicate that both Irreplaceable and Optimal Critical Biodiversity Areas (CBA) are present in the study area.

A combined watercourse area of 380.49 ha was delineated in the Upper Vaal WMA section of the study area (wetlands and dams), which is significantly larger compared to the combined watercourse area of 19.25 ha present in the Usutu to Inkomazi WMA (wetlands, riparian streams and dams). Watercourses in the Usutu to Inkomazi Water Management Area included five wetlands with a combined area of 6.97 ha, four riparian streams with a combined surface area of 8.86 ha, and small dams with a combined area of 3.42 ha.

Delineated wetland areas in the Usutu to Inkomazi WMA can be classified into two types of hydro-geomorphic (HGM) units based on the systems developed by Ollis et al. (2013). The number and combined size of type HGM wetland unit delineated in the Usutu WMA include the following:

- One channelled valley bottom wetland (area of 0.59 ha)
- Four seep wetlands (combined area of 6.38 ha)

Only wetland and dam watercourses were identified and delineated in the Upper Vaal WMA, and can be classified into three types of hydro-geomorphic (HGM) units based on the systems developed by Ollis et al. (2013). The number and combined size of each type HGM wetland unit delineated in the Upper Vaal WMA consists of the following:

- One channelled valley bottom wetland (combined area of 1.90 ha)
- Three unchannelled valley bottom wetlands (combined area of 83.20 ha)
- Five seep wetlands (combined area of 294.45 ha)

The Present Ecological State (PES) of delineated watercourses assessed in the Usutu to Mhlatuze WMA range from Largely natural (Class B PES) to Largely modified/ Seriously modified (Class D/E PES). The majority of the watercourses have a Moderately modified (Class C) PES or worse. The Ecological Importance and Sensitivity (EIS) values range from Moderate/ Low to High.

The Present Ecological State (PES) of delineated wetlands assessed in the Upper Vaal WMA range from Pristine/ Largely natural (Class A/B PES) to Seriously modified/ Critically modified (Class E/F PES). The seep and unchannelled valley bottom wetlands located above the proposed new Overvaal Tunnel are is the best condition, with PES values that range from A/B to B/C. The Ecological Importance and Sensitivity (EIS) of the same three wetlands have a Very high value, while remaining wetland range between Very high to Moderate.

Potential impacts on wetland and riparian watercourses related to the project include the following:

- Loss of watercourse habitat as a result of the construction of new infrastructure. This includes rail line crossings, temporary and permanent access roads, temporary laydown areas, berms and cut-off drains, and temporary construction camps.
- Erosion and desiccation of watercourses at new rail and road crossings, and along cut-off drains and diversion channels.
- Reduced water quality due to stockpile (sediment), hydrocarbon and coal dust contaminated water runoff from access roads and other infrastructure into surrounding wetlands and riparian watercourses (GCS, 2015a).

- Desiccation of wetland habitat as a result of reduced groundwater inflow. Reduced groundwater inflow into wetlands can be caused by the fracturing of the shallow aquifer as a result of the construction of the new Overvaal Tunnel (GCS, 2015b).
- Encroachment of alien plant species into wetland and riparian watercourses.

9. ENVIRONMENTAL CONCERNS AND POTENTIAL IMPACTS

This section provides feedback on the issues and impacts identified during this EIA process, including:

- Overview of the methods utilised to identify the impacts;
- The impacts that were identified;
- The methods used to assess the significance of the impacts; and
- Recommendations for management and mitigation of the impacts.

In addition each of the identified feasible alternatives presented in Section 6 are discussed in relation to the significance of the impacts.

9.1. Approach and Methodology

The identification, investigation and assessment of potential impacts is the primary objective of the EIA process. The final assessment and consequent provision of suitable alternatives, management and mitigation measures, is achieved through a three step process, namely:

1. Screening and identification of potential impacts and alternatives;
2. Investigation of selected potentially significant impacts and feasible alternatives;
3. Assessment of significance of potentially significant impacts and comparative assessment of feasible alternatives; and
4. Identification of measures to avoid, manage, mitigate, and reduce the potentially significant impacts and identification of the most preferred alternative.

The Scoping report fulfilled the first two steps in the process. The EIA phase and consequent EIAR and EMPr aims to address the remaining steps. This section of the EIAR therefore serves to provide brief feedback on the findings of the Scoping Phase and then to provide detailed assessment of the significance of the relevant issues and impacts and subsequently to identify recommendations for managing and mitigating these impacts.

9.2. Impact Identification

The issues that have been identified have been determined through various site visits, perusal of published information, brainstorming amongst the consultants and specialists, and issues raised by interested and affected parties during the public consultation. In order to identify the potential impacts which may occur as a result of the proposed project a matrix was prepared. The matrix utilises the proposed project phases (namely construction, operation and decommissioning), as well as the components of the receiving environment (namely Social, economic, cultural and heritage, ecology, hydrology, physical and air) to identify the relevant potential impacts. The impact identification process is detailed in the Scoping Report. Table 21 lists the impacts which were identified during scoping that required further investigation and assessment. In addition, further potential impacts were identified subsequent to the finalisation of the scoping report and have been included in this impact assessment (these impacts are indicated in bold in **Table 21**).

TABLE 21: LISTS OF IMPACTS THAT REQUIRED FURTHER INVESTIGATION AND ASSESSMENT.

Development Phase	Impact
Construction	Nuisance from dust and noise
	Visual intrusion
	Increased pressure on existing infrastructure.
	Increase in the spread of diseases (including sexually transmitted diseases and HIV/AIDS).
	Impact on sense of place.
	Traffic congestion and pavement damage.
	Loss of land capability (agricultural potential) and disruption of farming activities.
	Potential markets for informal trading
	Employment creation
	Potential effect on tourism and eco-tourism
	Potential increase in stock theft
	Disruption to infrastructure and services
	Impacts of vibration
	Impact on historical and cultural sites (e.g. archaeological sites, historical sites, graves and cemeteries).
	Dust settlement impact on plants

	Impact on habitat of threatened animals
	Impact on threatened plants
	Impact on protected species
	Impact on indigenous natural vegetation
	Impact on wetlands
	Establishment and spread of Listed Invasive Plant Species
	Sedimentation
	Alteration of watercourse dynamics.
	Impacts of water use on resource sustainability.
	Pollution of water resources
	Geological Instability
	Waste management and disposal
	Impacts on the safety and security of neighbouring/surrounding settlements
	Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer.
	Increase bedrock fracturing and opening of fractures / faults connecting the shallow weathered aquifer and deeper fractured bedrock aquifer.(If drill and blast method is used)
	Surface water contamination (as a secondary effect to groundwater contamination)
	Off road driving beyond the development footprint
	Re-establishment of regionally indigenous species in rehabilitated areas
	Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)
Operation	Impact on sense of place

	Impact on current land-use
	Alteration of watercourse dynamics
	Impacts of Erosion
	Pollution of water resources
	Loss of land capability (agricultural potential)

9.3. Significance Assessment Methodology

The impact assessment methodology is guided by the requirements of the NEMA 2010 EIA Regulations. The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, and Magnitude) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk for both pre- and post-mitigation.

In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment was applied to all identified alternatives. Where possible, mitigatory measures have been recommended for impacts identified.

9.3.1. DETERMINATION OF ENVIRONMENTAL RISK

The Significance (S) of an impact is determined by applying a Prioritisation Factor (PF) to an Environmental Risk (ER).

The environmental risk is dependent on the Consequence (C) of the particular impact and the Probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the Consequence of the impact is represented by:

$$C = \frac{(E + D + M + R) \times N}{4}$$

Each individual aspect in the determination of the Consequence is represented by a rating scale as defined below:

TABLE 22: CRITERIA FOR THE DETERMINATION OF IMPACT CONSEQUENCE.

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the proposed project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or

Aspect	Score	Definition
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the Consequence has been determined, the Environmental Risk is determined in accordance with the standard risk assessment relationship by multiplying the Consequence and the Probability (refer to FIGURE 41). Probability is rated/scored as per TABLE 23.

TABLE 23: PROBABILITY SCORING.

Aspect	Score	Definition
Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \times P$$

Consequence						
	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Probability				

FIGURE 41: DETERMINATION OF ENVIRONMENTAL RISK.

The outcome of the environmental risk assessment results in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in TABLE 24.

TABLE 24: ENVIRONMENTAL RISK CLASSES.

Value	Description
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/ mitigated.

9.3.2. IMPACT PRIORITISATION

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GN R. 543), it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact Prioritisation Factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings, but rather to focus the attention of the decision-making authority on the higher priority / significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/ mitigation impacts are implemented. TABLE 25 lists the criteria considered in determining the prioritisation factor and their relevant scores.

TABLE 25: CRITERIA FOR THE DETERMINATION OF PRIORITISATION.

Aspect	Score	Description
Public Response (PR)	Low (1)	Issue not raised in public responses.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in TABLE 25. The impact priority is therefore determined as follows:

$$Priority = PR + CI + LR$$

The result is a priority score which ranges from 3 to 9 and a consequent Prioritisation Factor ranging from 1 to 2 (refer to TABLE 26).

TABLE 26: DETERMINATION OF PRIORITISATION FACTOR.

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.50
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact Significance the Prioritisation Factor is multiplied by the Environmental Risk of the post mitigation scoring.

$$S = ER \times PF$$

The ultimate aim of the Prioritisation Factor is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

TABLE 27: ENVIRONMENTAL SIGNIFICANCE RATING

Value	Description
< 9	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥9; <17	Medium (i.e. where the impact could influence the decision to develop in the area),

≥ 17	High (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

9.3.3. SPECIALIST INVESTIGATIONS

It is important to note that in identifying, describing, and assessing the impacts a team of specialist sub-consultants were consulted and appointed to undertake individual specialist studies. These studies informed the findings of this EIAR and are appended to this EIAR.

9.4. Description and Assessment of Potential Impacts

This section provides a comprehensive description of each impact identified during the scoping phase that may arise from the proposed development. However, not all of the impacts identified during the scoping phase were assessed further in the EIA phase. A list of the impacts not assessed further in the EIA phase is presented in TABLE 28. No further assessment was done on these impacts because their significance is anticipated to be similar regardless of the specific location of the infrastructure within the study area. Further, it is anticipated that the significance of these impacts can be reduced through the correct implementation of standard management and mitigations measures, which are included in Transnets standard operating procedures and/or this Draft EIAR and accompanying Draft EMPr.

TABLE 28: IMPACTS NOT CONSIDERED FOR ASSESSMENT IN EIA PHASE.

Development Phase	Impact
Construction	Fire hazard
	Potential in-migration of people.
	Impacts on pedestrian and road safety.
	Opportunities for local contractors and SMEs.
	Impact on property values
	Erosion
	Impact of borrow pits
	Soil pollution
Operation	Impact on property value

	Air pollution
	Impact on existing infrastructure
Decommissioning	Waste management and disposal

9.4.1. CONSTRUCTION PHASE

9.4.1.1. NOISE

During construction of the tunnel and associated activities, there is likely to be a requirement for earthworks (clearing vegetation and topsoil's to prepare for construction). These activities are likely to generate noise, which could be a nuisance for local inhabitants and sensitive receptors.

Blasting during tunnelling will generate noise to the surrounding receptors. Blasting is noisier than using a Tunnel Boring Machine (TBM). Blasting is typically done twice a day, with rubble clearance and charge preparation taking up much of the time between blasts. Provided that the blasting programme is clearly explained to the surrounding residents, it is highly unlikely that the two blasting events will cause any discomfort or distress to any of the residents.

Impact Name	**Noise pollution**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	3	Reversibility of Impact	1	1
Duration of Impact	2	2	Probability	4	4
Environmental Risk (Pre-mitigation)					-9.00
Environmental Risk (Post-mitigation)					-8.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
Final Significance					-8.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

1. General (i.e. applicable to the proposal):

- The noise levels emanating from the construction must adhere to the requirements of SANS 10103 and the Noise Control Regulations (GN R154) promulgated under the ECA;
- All construction equipment must be serviced and maintained in good working condition to ensure that noise emitted is reduced as far as practically possible;
- All construction operations should, wherever practical, only occur during daylight hours;
- No noisy construction, especially blasting, must occur at night (if night work is required) without prior written consent from the nearby residents;
- Construction staff should be given “noise sensitivity” training in order to mitigate the noise impacts caused during construction;
- Blasting can be an emotive issue for residents around an excavation area. Good liaison between operator and residents is essential to prevent unnecessary anxiety. Wherever possible, the operator should inform each resident of the proposed times of blasting and of any deviation from this programme in advance of the operations;
- On each day that blasting takes place it should be restricted as far as practicable to regular periods. Blasthole drilling can cause excessive noise emissions, particularly when carried out at, or near, ground level and close to the site boundary. The choice of appropriate drilling rigs, such as down-the-hole hammers or hydraulic drifters as opposed to compressed air drifters, will reduce the impact of noise emissions from this activity; and
- Each blast should be carefully designed to maximize its efficiency and reduce the transmission of noise;
- It is good noise pollution practice to not leave vehicle engines idling unnecessarily, and to remain as far as practical from any noise sensitive areas.

9.4.1.2. NUISANCE FROM DUST

During the construction of the proposed project, dust pollution is anticipated due to clearing of vegetation for lay down areas, a construction camp, construction work and other associated construction activities. There are numerous farm homesteads, guest house and AFGRI storage facilities (Silos) sufficiently close to the sites to be affected by dust during construction.

The original stockpile area is situated towards the west of the N2 road. Transnet service road on top of the tunnel cuts this alternative into two halves (one to the north and another half to the south of the tunnel). The closest sensitive receptors for original stockpile area are situated approximately 400m towards the east of the stockpile site, and comprise of small settlement (Bambanani Sakhisizwe Communal Property Association) and the N2 road users that are situated towards the east of the proposed project site. This is close enough to pose a potential dust nuisance.

The area within and around stockpile alternative area 1 and 5 are utilised for grazing, agriculture, (cultivation being the dominant activities) as well as AFGRI storage facilities. Alternative area 1 and 5 are situated approximately 600m from the tunnel entrance towards the west, which is a reasonable distance for transportation of materials from the tunnel. The closest sensitive receptor is AFGRI situated approximately 100m from each site.

Stockpile alternative area 20 and 21 are situated towards the west of the N2 road and the surrounding area is utilised for cultivation and grazing. The closet sensitive receptors are approximately 1200m to the North West of the proposed project site and are comprised of a guest house and a farmstead with associated outbuildings. Alternative 20 and 21 boundary borders the N2 road towards the east.

Stockpile alternative area 2 is situated towards the south of the proposed tunnel and the closest sensitive receptors will be the road users and small settlement that are both situated approximately 1500m towards the east of the alternative area 2.

Stockpile alternative area 11 is situated towards the east of the N2 road and North of the proposed tunnel respectively. The closest receptors are a farmstead with associated outbuildings approximately 2000m to the north of the stockpile area and small settlement situated approximately1600m towards the eastern part of the stockpile area. The last receptor for alternative area 11 will be road users of the N2 road since it borders this alternative towards the west. Like all other alternatives the land use surrounding alternative area 11 is cultivation, road and grazing.

It is possible that excessive dust generated during construction may adversely affect the production of the adjacent lands. Adverse impacts of excessive dust on agricultural land may include: reduced photosynthesis; increases pest and disease incidence; and hindered pollination.

The significance of this impact will in addition to the proposed project depend on the exact location of the lay down area and stockpile area in relation to those sensitive receptors. Dominant/ prevailing wind is from the west north west direction, therefore receptors situated towards the east (Bambanani community) of the proposed project site are anticipated to be more affected than other receptors,

Impact Name	**Nuisance from dust**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	4	3
Duration of Impact	2	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-9.00
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					Medium

Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-5.25

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

2. **General** (i.e. applicable to both the double tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- A noise and dust (fallout dust) monitoring plan must be developed by a suitably qualified professional and implemented throughout the construction phase. This monitoring plan should focus on the Tunnel construction and associated infrastructure (including the stockpile area). The monitoring plan must include the establishment of relevant baseline measurements;
- The measured dust levels (dust fall out as a minimum and PM10 if necessary) must comply with the requirements of the National Air Quality Standards published in accordance with the NEM:QA and SANS 1929. Relevant dust control and suppression must be implemented timeously if exceedances are recorded;
- Appropriate dust suppression mechanisms, approved by the ECO, must be implemented on un-surfaced access roads, active work areas, and on large exposed soil surfaces, including the stockpile area;
- Speed of construction vehicles must be controlled (recommended <30km/hr) on un-surfaced dedicated access roads and within the active work areas;
- Appropriate control and preventative measures must be implemented to prevent dust generated from transporting materials (e.g. tipper trucks);
- The stripping of topsoils and clearing of vegetation should be phased in such a manner so as to minimise the period between clearing and commencement of construction on specific areas;
- Rehabilitation of cleared and disturbed areas must be undertaken as soon as practically possible following completion of construction on the specific area;
- Road users should be informed in the form of a notice board of time and date in which blasting will be undertaken, particularly near the N2 national road;
- For the Drill and Blast method, temporary blasting doors should be used at the tunnel portal to reduce dust; and
- Water should be sprayed onto the excavation phase to reduce dust.

Alternative Specific (i.e. applicable to preferred stockpile alternative areas (1, 2, 5, 11, 20, 21, original area) and associated construction activity sites:

- The relevant landowner and occupiers residing in the homesteads located in close proximity to the site selected for laydown and stockpile sites should be consulted and informed of dust anticipated during construction; and
- Dust receptors in the vicinity of the stockpile site should be included in the monitoring plan; it is proposed that all receptors within 2km of the construction works and stockpiles be identified as locations for dust monitoring points.

FIGURE 42: VIEW OF THE AFGRI STORAGE FACILITIES AND OVERVAAL GUEST HOUSE TOWARDS THE WEST OF TUNNEL.

9.4.1.3. GEOLOGICAL INSTABILITY

The existing tunnel and surrounding area is underlain by a succession of sedimentary rocks of the Karoo Sequence. Locally the Karoo Sequence is represented by rocks of the Vryheid Formation, Ecca Group. The Karoo sediments are comprised of siltstones, carbonaceous siltstones and sandstones. These rocks have been intruded by a massive dolerite sill. Localised faulting is evident but displacements are generally slight. The drainage paths observed on the surface topography are considered to be controlled by the structural geology (Jones & Wagener, 2009). The borehole data supports the information from the construction of the existing tunnel in that the dolerite sill is extensive and that the proposed project will also be located entirely within the dolerite sill (Jones & Wagener, 2009).

The nature of the underlying geological features and the stability/ instability thereof will determine the types of excavations required and the extent to which blasting (if preferred) is required. The construction of a tunnel on unstable geological formations increases the risk of potential failure. In this regard it is crucial that the geotechnical stability of the specific location of the proposed project is considered and if necessary mitigating measure provided.

During tunnel construction caution must be taken to select the appropriate tunnelling method and appropriate charge level not to cause further increase in bedrock fracturing or to increasing the hydraulic conductivity between shallow weathered and deeper fractured bedrock aquifers. This will help reduce the risk of impacting the groundwater levels of weathered aquifer which sustain spring flow and groundwater dependent wetlands. This will also assist in reducing inflows into the tunnel as well as the extent of the drawdown radius of influence. During construction groundwater bearing faults and fracture zones encountered within the tunnel must be sealed.

A geotechnical investigation has been carried out recently and that the conditions stipulated in this report should be complied with (See Appendix P).

Impact Name	**Increase bedrock fracturing and opening of fractures / faults connecting the shallow weathered aquifer and deeper fractured bedrock aquifer.(If drill and blast method is used)**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	4	2
Environmental Risk (Pre-mitigation)					-15.00
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					2.00
Final Significance					-15.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

3. General (i.e. applicable to the proposed project/ proposal alternatives:

- Care must be taken to select the appropriate tunnelling method not to cause further increase in bedrock fracturing, nor increasing the hydraulic conductivity between the shallow weathered and deeper fractured bedrock aquifers.

9.4.1.4. VISUAL IMPACT AND IMPACT ON SENCE OF PLACE

From a visual impact point of view, the significance of the impact is dependent on various criteria. The proposed tunnel will be underground, however there may be potential visual impacts associated with the construction phase in particular. These are described and discussed briefly herein:

- Visual Intrusion: The nature of intrusion or contrast (physical characteristics) of the construction camp and construction related activities (including dust) may impact on the visual quality of the surrounding environment and its compatibility / discord with the landscape and surrounding land use. It is likely that until such time as the stockpile area is rehabilitated that this feature will represent a significant visual intrusion.
- Visibility: The area / points from which proposed project components will be visible. In this case, it will include the number of farmsteads and the length of road with possible views towards the components of the proposed project (refer to FIGURE 43).
- Visual exposure: Visual intrusion and visibility - qualified with a distance rating - indicate the degree of intrusion. Visual exposure relates directly to the distance of the view. It is a criterion used to account for the limiting effect of increased distance on visual impact. The impact of an object in the foreground (0 – 800m) is greater than the impact of that same object in the middle ground (800m – 5.0 km) which, in turn is greater than the impact of the object in the background (greater than 5.0 km) of a particular scene. Distance from a viewer to a viewed object or area of the landscape, influences how visual changes are perceived in the landscape. Generally, changes in form, line, colour, and texture in the landscape become less perceptible with increasing distance. The impact of an object diminishes at an exponential rate as the distance between the observer and the object increases. In summary the closer a receptor (e.g. farmstead) is to a visual intrusion (e.g. construction camp/ stockpiles) the greater the likely visual impact.

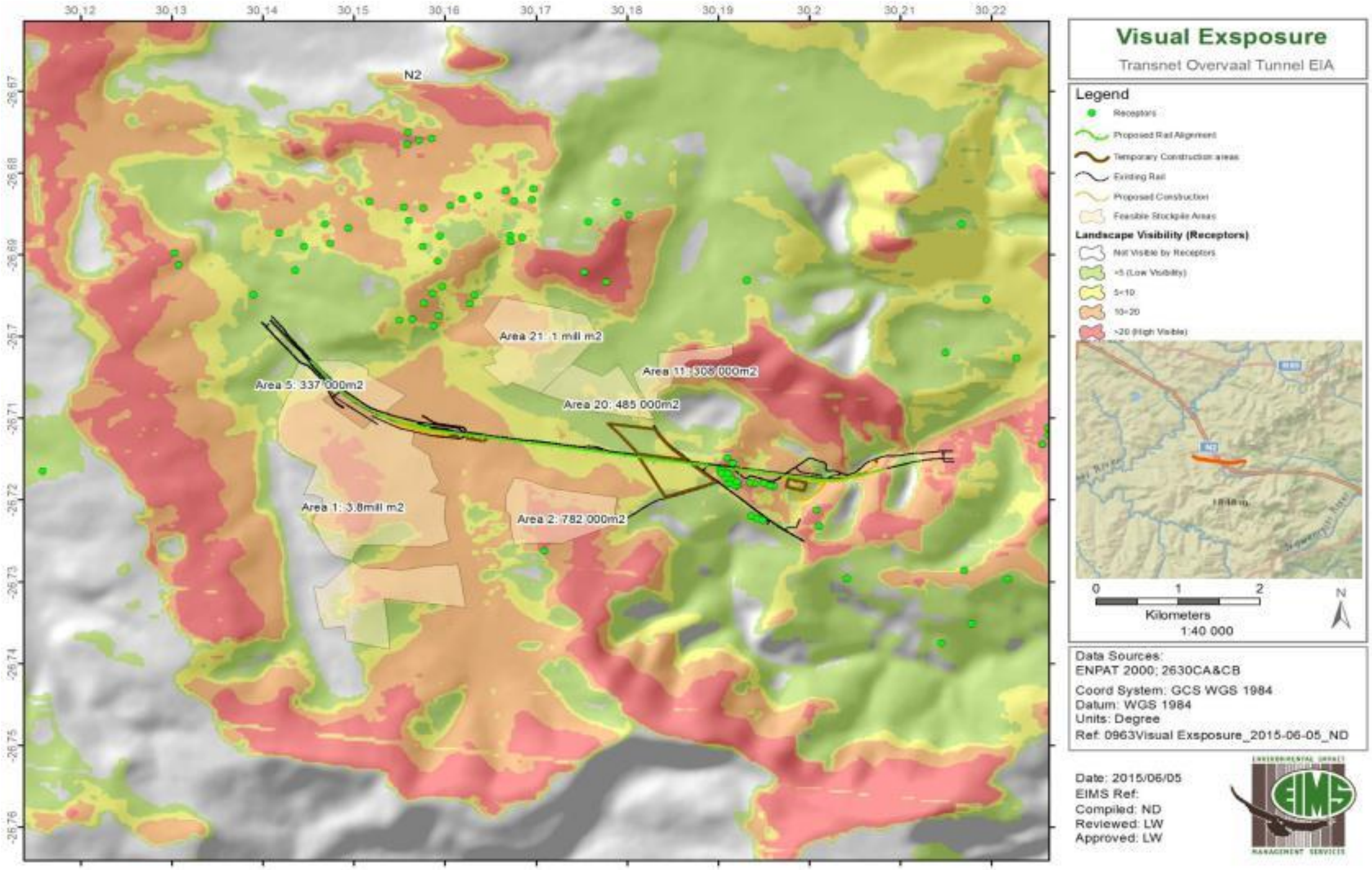

FIGURE 43: VISUAL EXPOSURE

- Sensitivity: Sensitivity of visual receptors and views to the proposed project (including the construction activities) will depend on:
  - The location and context of the viewpoint;
  - The expectations and occupation or activity of the receptor; and
  - The importance of the view (this may be determined with respect to its popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for, its enjoyment and references to it in literature or art).

The most sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape (e.g. the N2; the Overvaal Guesthouse);
- Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; or
- Occupiers of residential properties with views affected by the proposed project and associated construction activities.

Other receptors which may be less sensitive to the proposed project may include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value); and
- People travelling through or past the affected landscape (proposed project and associated construction activities) in cars, on trains or other transport routes; and people at their place of work.

The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

It is anticipated that the construction of the proposed project is likely to have a cumulative visual impact including aspects such as:

- Construction vehicles associated with the construction (e.g. cranes, hauling vehicles, TLB's, etc.);
- Light pollution at night since there is a possibility that construction can be undertaken on a 24hr basis; and
- Facilities specifically associated with the construction, such as the temporary construction camps, soil/ rock stockpiles and lay down areas.

The cumulative effect is the end result of the visual effect when taking into consideration the visual effect of the existing elements / structures in combination with the structures of the proposed project.

Sense of place can be described as 'characteristics that make a place special or unique, as well as to those that foster a sense of authentic human attachment and belonging'. The construction of the proposed project within an area that holds a specific sense of place may have the potential to alter this. The impact on the sense of place is closely linked to the likely visual impact of an activity. For the purpose of construction, lay down areas and a construction camp will be required and will have impacts on the visual characteristics of the area.

For the purposes of the visual and sense of place impact it is anticipated that the tunnel construction and associated temporary and permanent activities, will have a limited and very short duration impact on surrounding sensitive receptors. The physical extent of the stockpile and the obvious intrusivity (until these sites are rehabilitated) indicates that the primary visual impact associated with the proposed project will be for these stockpiles.

With reference to FIGURE 43 above, visual exposure from preferred stockpile site is not anticipated to be of significance concern. Only few receptors are located in close proximity to the site and since it is assumed that the stockpile sites will be rehabilitated following construction phase, visual intrusion is therefore not anticipated to be of significant concern (see Figure 44 and Figure 45 below).

Alternative area 1 and 5 are situated approximately 100m of the AFGRI storage facilities and approximately 1000m of the Overvaal Guest house respectively. It is therefore anticipated that visual intrusion will be higher from the AFGRI facility if alternative area 3 and 5 are preferred for stockpiling.

Stockpile alternative area 20 and 21 if preferred will have visual impact to the N2 road users since their boundaries towards the east borders the N2 national road. Other sensitive residential receptors are not within close proximity (<900m) to alternative area 20 and 21. Those include small settlements situated towards the eastern part of the stockpile areas, farmsteads buildings and Overvaal guest house that are situated towards the North West of the stock pile area 20 and 21. Farmstead to the North of the proposed project site is located approximately 2000m of the alternative area 20 and 21 respectively.

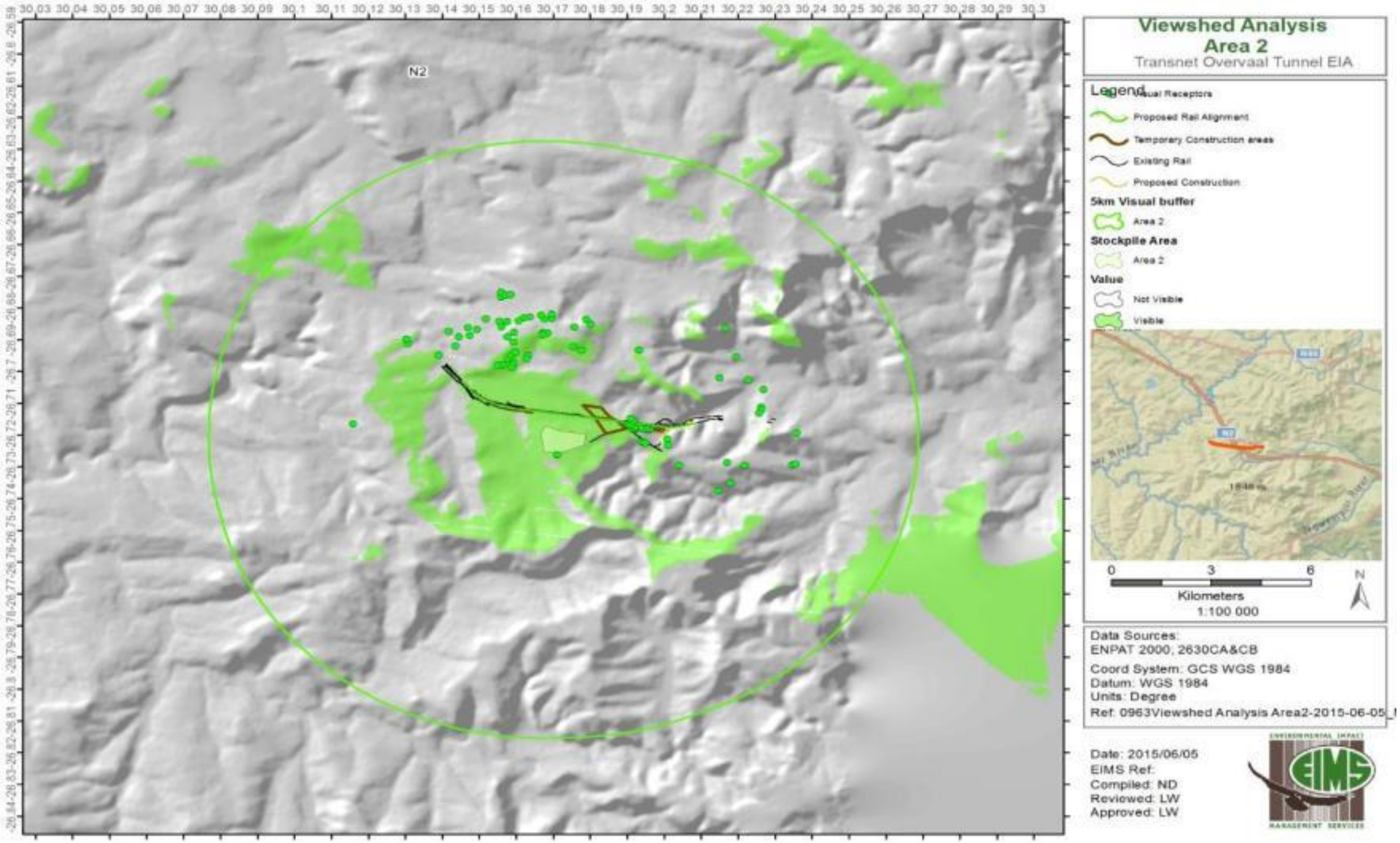

FIGURE 44: VIEWSHED ANALYSIS OF STOCKPILE AREA 2

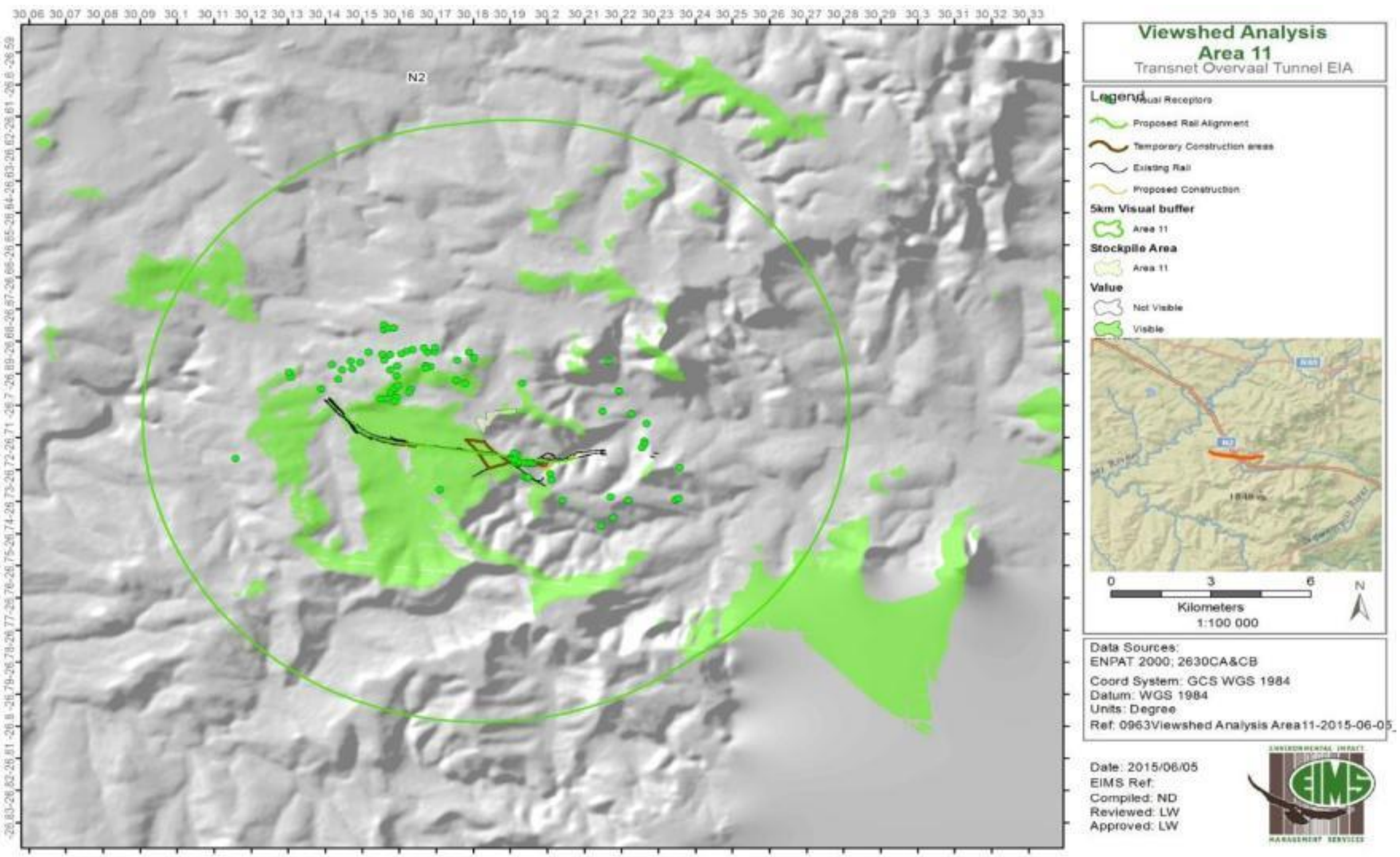

FIGURE 45: VIEWSHED ANALYSIS OF STOCKPILE AREA 11

Stockpile alternative area 2 closest sensitive visual receptors will be the road users and small settlement that are both situated approximately 1500m towards the east.

Stockpile alternative area 11 closest visual receptors will be the road user together with both the small settlement and farmstead situated approximately 1600m away.

Impact Name	**Visual impact**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	2	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-4.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4.67

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

4. **General** (i.e. applicable to both the double tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- The stripping of topsoils and clearing of vegetation should be phased in such a manner so as to minimise the period between clearing and commencement of construction on specific areas;
- Rehabilitation of cleared and disturbed areas must be undertaken as soon as practically possible following completion of construction on the specific area;
- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the construction site;
- A waste management plan must be prepared for the construction process to ensure that waste is not disposed of or stored indiscriminately in such a manner that it creates a visual intrusion;
- Construction sites must be kept clear of litter and good housekeeping must be implemented;
- A community liaison officer must be appointed to consult and liaise with the neighbouring communities. Concerns and complaints must be addressed timeously, appropriately and practically; and

- Where possible, avoid placing construction activities (e.g. construction camp and lay down areas) in close proximity to homesteads.

Alternative Specific (i.e. applicable to preferred stockpile alternative areas (1 or 2 or 5 or 11 or 20 or 21 or Original area and Laydown Sites Alternatives):

- If practical, rehabilitation of the stockpiles should occur in parallel with the construction works;
- A selection of suitable indigenous vegetation should be planted on the stockpile during rehabilitation in order to blend the area with the surrounding environment;
- Stockpile should be sized in such a manner that reduce visual intrusion to the surrounding residents, tourists and road users travelling along N2; and
- Materials and equipment should be place away from the any water body or drainage lines.

9.4.1.5. INCREASED PRESSURE ON EXISTING INFRASTRUCTURE

The construction camp/s would require ready access, access to a water source, sanitation facilities, and appropriate waste management systems. The proposed project is expected to result in limited pressure on existing infrastructure and where impacts will occur, these will be limited mostly to the construction phase of the proposed project. Where possible, construction sites should tap/link into existing infrastructure and services for these purposes. It is understood that there is an existing access road and boreholes which may be used as a source of water. There would however be a requirement to construct temporary infrastructure for sanitation facilities and waste storage. As such limited infrastructure and services may thus have to be established on the site or the construction camp. Solid waste and sewage will require proper disposal at registered disposal and treatment facilities and water must be accessed only from authorised and licensed water resources.

The transportation of construction material to and from site will at times involve heavy loads requiring heavy trucks and a marginal increase in traffic volume. This may result in the deterioration of the road infrastructure in the surrounding area. The impact will depend on the outcome of the comparative assessment of the identified alternative of locating the accommodation facilities for the construction teams on site or closest town (e.g. Ermelo or Sheepmoor) as well as locations of respective construction camps and facilities. Please refer to Section 10 for more details on the comparison assessment undertaken.

Impact Name	**Increased pressure on existing infrastructure**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	3	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	2	1

Environmental Risk (Pre-mitigation)	-5.00
Environmental Risk (Post-mitigation)	-2.00
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-2.33

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

5. General (i.e. applicable to both the proposed proposal site alternatives):

- Upgrading and maintenance of road infrastructure where necessary before construction;
- Housing of construction workers in nearby towns such as Ermelo or Sheepmoor, thus, utilising existing service infrastructure; and
- Establishment of an Environmental Monitoring Committee (EMC) to act as a communication link between the local community and Transnet, in this case in relation to damaged infrastructure.

9.4.1.6. IMPACTS ON THE SAFETY AND SECURITY OF NEIGHBOURING/SURROUNDING SETTLEMENTS

The presence of construction workers, but more importantly, the potential influx of, especially, criminal opportunists, could potentially affect the safety and security of residents of surrounding settlements, farmers, farm labourers, and construction workers. These impacts could include poaching of wildlife and livestock. The closest formal settlement (Sheepmoor) is approximately 12km to the east of the proposed project site, but there are numerous farm homesteads and farm labourer houses in proximity to the proposed project.

Impact Name	**Safety and Security**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	2	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	3	1
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-2.00

Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-2.33

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

6. **General** (i.e. applicable to both the proposed tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- Construction teams should be clearly identified by wearing uniforms and/or wearing identification cards that should be exhibited in a visible place on their body;
- Encourage land owners to keep stock away from the proposed project area for the duration of construction;
- Construction workers should be accommodated in areas with existing infrastructure (e.g. nearby town) as opposed to Greenfield sites. Only necessary security personal will be permitted to reside on the construction area (the personnel must be communicated and identifiable to the relevant landowners);
- Instant dismissal and prosecution of any staff caught in criminal activities of any kind;
- Establishment of an EMC to act as a communication link between the local community and Transnet, in this case in relation to criminal activity;
- Inform local law enforcement agencies and security organisations of the possibilities of increased criminal activity in the area; relevant farm access protocols and landowner access conditions must be complied with at all times;
- labours and contract workers must be accompanied by a responsible supervisor at all times;
- Workers may not keep (or have in their possession on site) any animals, including livestock, poultry, wildlife or pets; and
- All access gates must be kept closed/open as required by the relevant landowner (signage in this regard should be provided).

Alternative Specific (i.e. applicable to preferred stockpile alternative areas (1 or 2 or 5 or 11 or 20 or 21 or Original area and Laydown Sites Alternatives):

- To ensure safety of livestock, site demarcated for rock material stockpiling and laydown area should be fenced with access to those areas controlled.

9.4.1.7. INCREASE IN THE SPREAD OF DISEASES (INCLUDING SEXUALLY TRANSMITTED DISEASES AND HIV/AIDS)

Any construction or development activity which causes migration of people has the potential to increase the spread of diseases. In this case, one of the most serious of these is HIV/AIDS. Induced migration, as well as the movement of contractor construction workers from elsewhere in the country, can potentially increase the spread of HIV/AIDS. Also, the construction of the proposed project will require construction materials to be transported to the site. Drivers of heavy vehicles are commonly seen as a contributing factor to the spread of the disease.

Activities such as prostitution and varying levels of promiscuity are often associated with groupings of construction workers. This could lead to scenarios where an infected construction worker coming into the area spreads the disease through unprotected intercourse with sex trade workers or local individuals, who, in turn, will spread it locally. Alternatively, an uninfected construction worker could become infected through unprotected intercourse and, on return to his/her place of origin spread the disease there. By implication, the potential increase in the transmission of sexually transmitted diseases (STDs) and HIV/AIDS becomes an issue of great concern, as it is especially problematic in a country where infection rates are already high. This is of particular concern, considering the proximity of established settlements (e.g. Sheepmoor) to the proposed project.

There is also the risk that if the construction camp is not managed efficiently, a lack of adequate water, sanitation, and waste facilities may lead to unhygienic living conditions and the easy spread of water-borne diseases. Such events will not only affect construction workers and thereby the progress on the construction of the proposed project, but may also spread to local communities.

Impact Name	**Increase in the spread of diseases (including sexually transmitted diseases and HIV/AIDS)**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	4	3	Reversibility of Impact	4	2
Duration of Impact	2	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-9.75
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1

The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-5.25

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

7. **General** (i.e. applicable to both the double tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- Include an HIV/AIDS education component in the induction programme for all incoming construction workers; and
- Develop employee wellness and public health programmes in collaboration with local municipalities. These could include regular health surveys, educational programmes and Voluntary Counselling and Testing (VCT) campaigns.

9.4.1.8. TRAFFIC CONGESTION AND PAVEMENT DAMAGE

It is anticipated that the construction of the proposed project will generate significant volumes of traffic as a result of:

- Large construction vehicles and plant mobilizing and demobilizing on the site;
- Transport of equipment for the proposed project by means of heavy vehicles; and
- Daily vehicle movements to and from site by the construction teams.

The additional traffic volumes have the potential to increase the local and regional traffic patterns and may result in localised congestion. In addition, the utilisation of existing roads may exceed the existing capacity and consequently may result in degradation of the road surfaces.

It should be noted that the proposed project site traverses the N2, with the tunnel itself passing below the N2. The N2 is a major and heavily utilised transport route running from Ermelo to Piet Retief. Based on on-site observations it is understood that the conditions of the N2 national road is in good condition and may be able to accommodate heavy load vehicles during construction. Based on EIMS's experience during the site inspections it is not anticipated that there is an existing traffic congestion issue around the proposed project site. It is however anticipated that during the holiday periods that traffic volumes along the N2 may increase substantially as a result of holiday makers travelling towards Swaziland, the North coast (KwaZulu Natal) and Durban.

Furthermore, other un-surfaced roads exist within the proposed project site and they are used for access by local farmers and AFGRI, as well as for maintenance of the existing tunnel.

Impact Name	**Traffic congestion and pavement damage**
Alternative	**Proposal**
Phase	**Construction**
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	1	Reversibility of Impact	2	2
Duration of Impact	2	2	Probability	2	2
Environmental Risk (Pre-mitigation)					-4.50
Environmental Risk (Post-mitigation)					-3.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-3.50

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

8. **General** (i.e. applicable to both the proposed tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- The final site access plans and traffic management plans must be submitted to the relevant Local, Provincial and National Roads Authority and any prescribed traffic management and safety measures must be implemented;
- A pre and post road pavement survey should be undertaken on all roads to be utilised regularly by the construction vehicles. The approach of ensuring that the post construction phase pavement is in an equal or better condition than the pre-construction phase must be followed;
- The construction activities must be phase in such a manner that the construction vehicles do not result in unusual traffic congestion, specifically during the daily peak travel periods and holidays; and
- All temporary and permanent access roads must be provided with adequate stormwater controls, designed in consultation with a suitably qualified engineer.

9.4.1.9. LOSS OF LAND CAPABILITY (AGRICULTURAL POTENTIAL) AND DISRUPTION OF FARMING ACTIVITIES

During construction, landowners who farm livestock may need to move their stock away from the areas surrounding the proposed project and associated construction activities. Construction activities may pose risks to animals in terms of potential poaching, as well as safety due to the increased movement of heavy and other construction vehicles. This could affect farmers' grazing plans in terms of the rotation of stock between grazing camps. It is recommended that grazing land be considered first for placement of construction activities that productive land utilised for cultivation.

Cumulative impacts include loss of earnings for farmers due to disruptions in activities and the temporary loss of grazing land. Loss of stock through theft or accidents will also lead to a loss of earnings. Such scenarios are likely to lead to increased tension and reduced co-operation between landowners and proposed project staff.

Except for the servitude that will be running above the tunnel, no additional permanent loss of land is anticipated due to the fact that the proposed Tunnel will be underground. However the area that is utilised for the stockpile will not be available for alternative use for the medium to long term. Thereafter it is anticipated that the rehabilitated stockpile could pending agreement with Transnet be utilised for other land-uses (e.g. stock grazing etc).

Impact Name	**Loss of land capability**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	3	3
Environmental Risk (Pre-mitigation)					-8.25
Environmental Risk (Post-mitigation)					-6.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-7.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

9. General (i.e. applicable to both the proposed tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- Landowners must be compensated at no less than market related value for the lost land capability;
- Transnet must liaise regularly with the affected landowners to ensure that due consideration is given to grazing plans, stock rotations and access requirements (in the event livestock needs to be temporarily evacuated from specific areas);

- A complaints register must be implemented and should be tabled and managed by the contractor;
- Any damage to public or private property, including roads, stormwater systems, fences, gates, buildings and other structures, pipelines, and other utilities and infrastructure and movable property, should be repaired, replaced or otherwise compensated for as agreed to with the affected party;
- Relevant farm access protocols and the Transnet access procedure must be strictly adhered to at all times;
- Footprint of soil and surface disturbance must be kept to the minimum required;
- Care must be taken to prevent pollution and unnecessary disturbance to soils, and adequate rehabilitation and reinstatement of the disturbed areas must be undertaken; and
- Ensure proper storage of hazardous substances to prevent contamination of soil within and around the proposed project associated activities (e.g. lay down areas and construction camp).

9.4.1.10. POTENTIAL MARKETS FOR INFORMAL TRADING

The closest grocery stores and shopping facilities to the proposed project are located in Sheepmoor, which is approximately 12 km away from the proposed project. This relatively far distance will make informal vendors close to the construction site an attractive option for construction workers.

The location of the accommodation for construction workers (either onsite or in a nearby town) may influence potential opportunities for informal traders. If construction workers are housed in a nearby town, it is likely that opportunities for informal traders will be reduced as there will be easy access for construction workers to formal retail outlets.

There are both positive and negative cumulative impacts. Informal trading will provide a temporary source of income for local households and indirectly increase money in the local economy, albeit by a small amount. Conversely, the presence of informal traders around the construction site may have detrimental effects on the local environment. There is likely to be an increase in littering, the uncontrolled dumping of refuse and the use of the surrounding areas as informal latrines.

Impact Name	**Potential market for Informal traders**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	1	1	Magnitude of Impact	1	1
Extent of Impact	3	3	Reversibility of Impact	1	1
Duration of Impact	2	2	Probability	2	3
Environmental Risk (Pre-mitigation)					3.50
Environmental Risk (Post-mitigation)					5.25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1

Low: Issue not raised in public responses	
Cumulative Impacts	1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.00
Final Significance	5.25

The recommended mitigation measures to assist in enhancing the significance of this impact are as follows:

10. **General** (i.e. applicable to both the proposed tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:
    - A dedicated area should be provided, controlled and maintained within the Tunnel construction area to allow local vendors to sell goods to the construction workers;
    - Care must be taken to ensure that safety and security of the surrounding residences is not compromised as a result of the traders;
    - Provide and service refuse disposal facilities;
    - Strict access control into and out of the construction area must be maintained; and
    - Provide access to temporary sanitation facilities for vendors at the construction area.

9.4.1.11. EMPLOYMENT CREATION

The construction of a tunnel is a specialized task which requires fairly specialized construction personnel. Therefore, a significant number of the construction team would be coming from elsewhere, and job opportunities for local people will be limited to temporary unskilled jobs, on-site and in the construction camp. According to the applicant R3, 867 billion is allocated for construction of the proposed project. The proposed project will generate 2 360 work opportunities, of which just over 846 will be for unskilled workers; thereby significantly contributing to the Government's job creation targets. Of 2 360, 533 employees will be skilled, while 980 will be semi-skilled. Apart from direct employment, local people and businesses could benefit through the supply of goods and services to the appointed contractors.

Concerns have been raised through the public participation process and meetings with various parties concerning the lack of employment opportunities provided for locals by such projects. While it is understood that much of the required work is skilled, it has been noted that sub-contractors conducting unskilled work also bring people in from outside the area. This is reportedly leading to negative sentiments towards Transnet. In order to ensure that a good relationship is maintained with the local community and local stakeholders, Transnet needs to take steps to ensure that as many local people are employed in such projects as is possible.

Cumulative impacts, as a result of potential employment creation, are both negative and positive. In communities with high levels of unemployment, as is the case in the communities surrounding the study area, there is competition for job opportunities. The occurrence of outsiders coming in and taking perceived employment opportunities may lead to conflict. However, the creation of temporary jobs for the previously unemployed will briefly increase disposable income in the area. This will have positive spin-offs for local business as there is more money circulating in the local economy.

Impact Name	**Employment creation**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	1	1	Magnitude of Impact	2	3
Extent of Impact	3	3	Reversibility of Impact	5	5
Duration of Impact	1	2	Probability	1	3
Environmental Risk (Pre-mitigation)					2.75
Environmental Risk (Post-mitigation)					9.75
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					11.38

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

11. General (i.e. applicable to both the proposed tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- Measures and targets must be put in place to ensure that Transnet and its contractors are required to employ local people whenever possible during construction;
- Prioritise sub-contracting to local SMEs;
- Establishment of an EMC to act as a communication link between the local community and Transnet. In this case the EMC would act as a means of informing the local community of job opportunities and informing Transnet of possible contractors in the local community. This may take the form of a local recruitment office established in consultation with the local Department of Labour; and

- Consultation with the local communities must ensure that the temporary nature of the employment opportunities is clearly communicated.

9.4.1.12. POTENTIAL EFFECT ON TOURISM AND ECO-TOURISM

Overvaal guest house is situated approximately 2000m to the north west of the proposed project and it might be affected both positively (i.t.o. providing accommodation facilities for contractors) and negatively (i.t.o. impact on other guests) by the proposed project during construction. Other tourism areas such as Wakkerstroom and Volksrust are far enough away from the proposed project not to be significantly affected by it.

Visual impact will be of concern to Overvaal guest house guests for majority of the stockpile areas (e.g. Stockpile area 1, 2, 5, 11, and 21). Please refer to Figure 46 below. However this impact is not anticipated to be highly significant. Visual intrusion from alternative area 20 to the Overvaal guest house is not anticipated to be of concern (see **Figure 47** below).

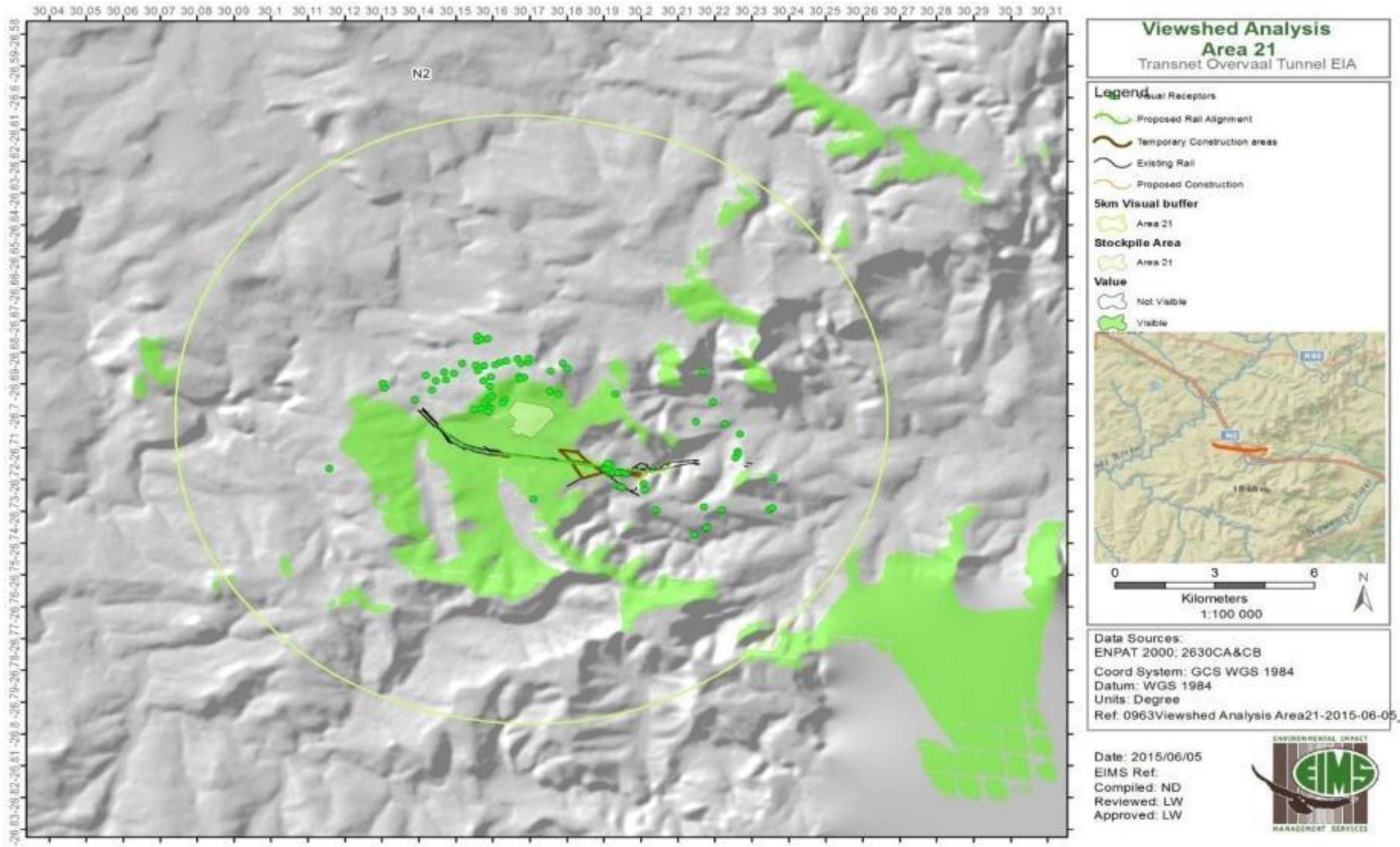

FIGURE 46: VIEWSHED ANALYSIS OF STOCKPILE AREA 21

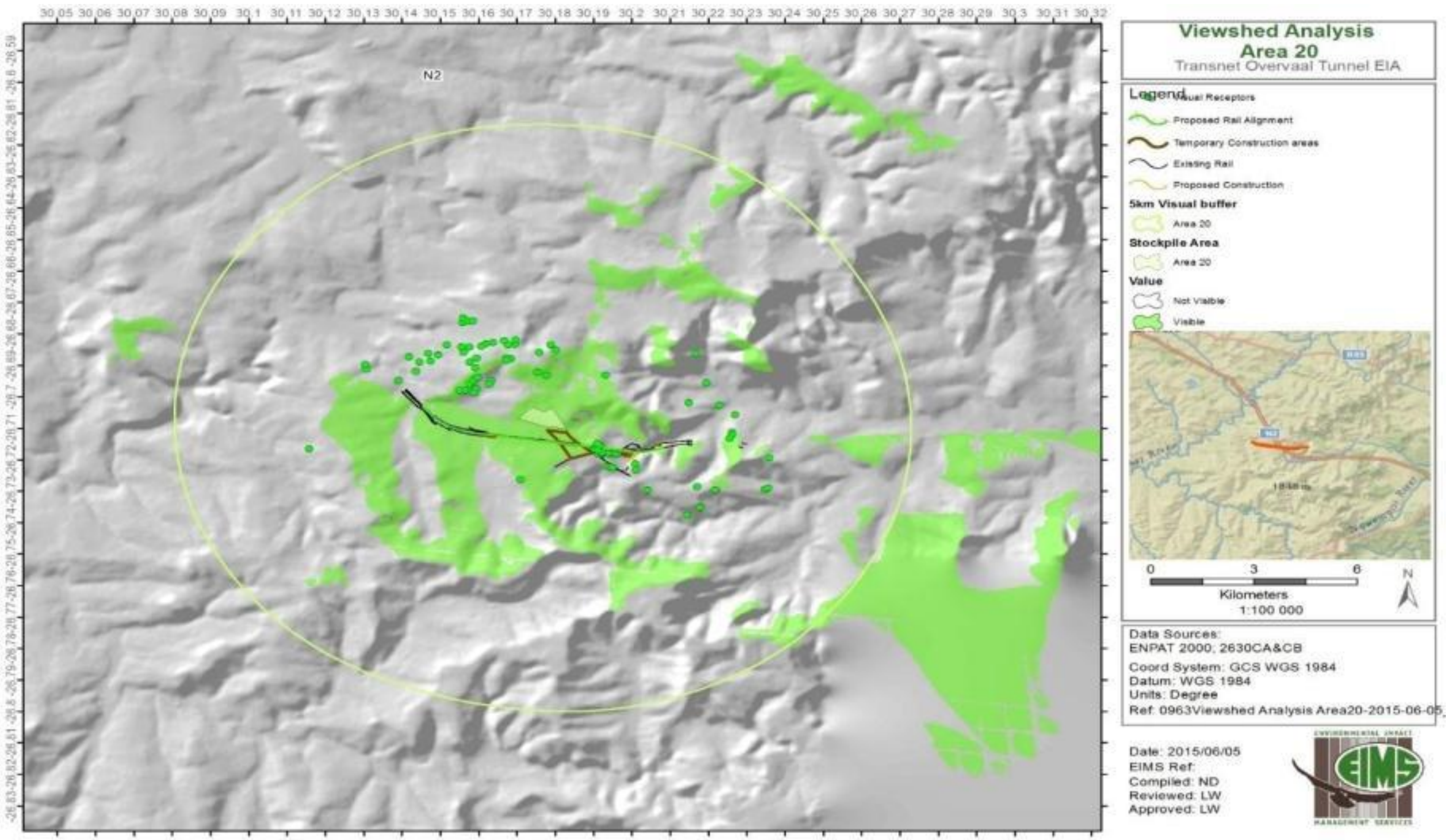

FIGURE 47: VIEWSHED ANALYSIS OF STOCKPILE AREA

Impact Name	Impact on tourism and eco-tourism				
Alternative	Proposal				
Phase	Construction				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	4	4	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	1	1
Environmental Risk (Pre-mitigation)					-4.25
Environmental Risk (Post-mitigation)					-4.25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4.96

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

12. **General** (i.e. applicable to both the proposed proposal site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- Where possible, contractors crew should be encouraged to utilise surrounding accommodation facilities (e.g. Overvaal guest house); and
- For additional relevant mitigation measures please refer to visual impact and impact on sense of place above.

9.4.1.13. POTENTIAL INCREASE IN STOCK THEFT

The theft/loss of a small number of livestock units could lead to substantial losses for surrounding landowners. A number of activities associated with the proposed project may result in increased stock theft on farms neighbouring the construction camp and those traversed by the proposed project. These activities may include, but are not limited to;

- The potential influx of migrants,
- The presence of a number of construction workers in the construction camp, and
- Workers accessing farms for construction.

The fact that the surrounding land-use and local economy relies heavily on farming practices suggests that this impact should be considered in the decision making process. Cumulative impacts include tension, particularly between local residents and people from outside, either specialist workers or migrants in search of work. Increased stock theft and poaching are likely to result in farmers becoming suspicious of work being done on their land and, therefore being unwilling to co-operate with proposed project staff.

Impact Name	**Increase in stock theft**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	3	1
Environmental Risk (Pre-mitigation)					-8.25
Environmental Risk (Post-mitigation)					-2.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-2.33

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

13. **General** (i.e. applicable to both the proposed tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- Construction teams should be clearly identified by wearing uniforms and/or wearing identification cards that should be exhibited in a visible place on their body;
- Encourage land owners to keep stock away from the proposed project area for the duration of construction;
- Construction workers should be accommodated in a nearby town and not on site. Only necessary security personal will be permitted to reside on the construction area (the personnel must be communicated and identifiable to the relevant landowners);
- Instant dismissal and prosecution of any staff caught in criminal activities of any kind;

- Establishment of a EMC to act as a communication link between the local community and Transnet, in this case in relation to criminal activity;
- Inform local law enforcement agencies and security organisations of the possibilities of increased criminal activity in the area; relevant farm access protocols and landowner access conditions must be complied with at all times;
- Labours and contract workers must be accompanied by a responsible supervisor at all times;
- Workers may not keep (or have in their possession on site) any animals, including livestock, poultry, wildlife or pets; and
- All access gates must be kept closed/open as required by the relevant landowner (signage in this regard should be provided).

9.4.1.14. DISRUPTION TO INFRASTRUCTURE, STRUCTURES AND SERVICES

The construction process may result in accidental damage to services. With reference to Figure 48 below Eskom transmission and distribution lines transverse the proposed project. Please refer to Figure 31 for the existing homestead within the proposed project servitude. This could have knock-on effects on the surrounding communities. During the public consultation process, concern was raised over decrease in the volume of water from the surrounding boreholes.

Construction of the tunnel is unlikely to put a significant impact on local services and infrastructure, however it is at this stage anticipated that, at least one homestead that is located along the proposed route will be affected by the proposed development. It is therefore recommended that, any damage to public or private property, be repaired, replaced or otherwise compensated for as agreed to with the affected party. The proposed project sites traverse the N2, a major transport route. Construction may result in a temporary disruption to traffic flow. Slow moving, heavy load trucks and smaller construction vehicles entering and exiting the N2 may require traffic calming measures to be introduced for safety purposes. This is likely to have an impact on daily road users.

Cumulative impacts of infrastructure and services being disrupted include road safety, should the necessary traffic calming measures not be implemented. Such factors are likely to negatively affect public sentiment towards the proposed project.

FIGURE 48: VIEW OF THE ESKOM POWER LINES CROSSING THE AREA OF THE PROPOSED PROJECT.

<table>
<tr><td>Impact Name</td><td colspan="5">Disruption to infrastructure and services</td></tr>
<tr><td>Alternative</td><td colspan="5">Proposal</td></tr>
<tr><td>Phase</td><td colspan="5">Construction</td></tr>
<tr><td colspan="6">Environmental Risk</td></tr>
<tr><td>Attribute</td><td>Pre-mitigation</td><td>Post-mitigation</td><td>Attribute</td><td>Pre-mitigation</td><td>Post-mitigation</td></tr>
<tr><td>Nature of Impact</td><td>-1</td><td>-1</td><td>Magnitude of Impact</td><td>3</td><td>2</td></tr>
<tr><td>Extent of Impact</td><td>3</td><td>3</td><td>Reversibility of Impact</td><td>2</td><td>2</td></tr>
<tr><td>Duration of Impact</td><td>2</td><td>1</td><td>Probability</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Environmental Risk (Pre-mitigation)</td><td>-5.00</td></tr>
<tr><td colspan="5">Environmental Risk (Post-mitigation)</td><td>-2.00</td></tr>
<tr><td colspan="5">Degree of confidence in impact prediction:</td><td>Medium</td></tr>
<tr><td colspan="6">Impact Prioritisation</td></tr>
<tr><td colspan="5">Public Response</td><td>1</td></tr>
<tr><td colspan="6">Low: Issue not raised in public responses</td></tr>
<tr><td colspan="5">Cumulative Impacts</td><td>1</td></tr>
<tr><td colspan="6">Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cumulative change.</td></tr>
<tr><td colspan="5">Degree of potential irreplaceable loss of resources</td><td>2</td></tr>
<tr><td colspan="6">The impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.</td></tr>
</table>

Prioritisation Factor	1.17
Final Significance	-2.33

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

14. General (i.e. applicable to both the proposed tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- A comprehensive service detection survey must be undertaken within the proposed project site, and any other ancillary construction activities (e.g. access roads, etc), prior to commencement of construction. The relevant representatives / organisations for detected services must be contacted and notified of the construction and relevant requirements implemented;
- In the event that any services are unintentionally disrupted suitable rectification and corrective action must be implemented timeously and if necessary compensation paid for damages.
- All work within Eskom's servitude areas shall comply with the relevant Eskom earthing standards in force at the time;
- No construction or excavation work shall be executed within 27.5 metres from any Eskom power line structure;
- Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances. After any changes in ground level, the surface shall be rehabilitated and stabilized so as to prevent erosion. The measures taken shall be to Eskom Transmission requirements;
- No mechanical equipment, including mechanical excavations or high lifting machinery, shall be used in the vicinity of Transmission line apparatus and/or services, without prior written permission having been granted by Eskom Transmission;
- No work shall commence unless Eskom Transmission has received the applicant's written acceptance of the condition specified in this letter of consent within 30 days of the date of this letter and or before commencement of any work;
- Eskom's Transmission rights and duties in the servitude shall be accepted as having prior right at all times and shall not be obstructed or interfered with;
- Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The applicant shall maintain the area concerned to Eskom Transmission satisfaction;
- The clearances between Eskom Transmission live electrical equipment and the proposed construction work shall be observed as stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (act 85 of 1993);

- Equipment shall be regarded electrically live and therefore dangerous at all times; and
- It is required of the applicant to familiarize himself with all safety hazards related to Electrical plant.

9.4.1.15. IMPACT ON HISTORICAL AND CULTURAL SITES

The construction of the proposed project has the potential to damage cultural and historical features (including paleontological and archaeological features). According to Huffman's (2007) distribution sequences of the Iron Age, the area does not fall within any known culture related to the Iron Age. During the heritage study undertaken by PSG Heritage, 9 heritage sites were identified of which all will require further mitigation work dependant on the site selection process for the stockpiles area.

The field investigation confirms that the study area is underlain by coarsegrained sandstone and dark grey to black-coloured carbonaceous shale and thin coal beds of the Vryheid Formation of the Ecca Group and a Dolerite sill of the Karoo Supergroup. The excavations for the extension of the western entrance to the tunnel will be into sediments of the Vryheid Formation. The plant fossils are in most cases highly fragmentary and coalified, leading to a lowering of the significance values for these fossils. The trace fossils found in the thinly interbedded sandstone are highly significant, but extremely rare. Medium Palaeontological sensitivity is therefore allocated to this section of the development.

Impact Name	**Destruction of palaeontology**				
Alternative	**Proposal/ Tunnel Western Entrance**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	1	Magnitude of Impact	5	5
Extent of Impact	3	1	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	3	1
Environmental Risk (Pre-mitigation)					-13,50
Environmental Risk (Post-mitigation)					4,00[4]

[4] Palaeontology is a science that relies on the exposure of fossils to add to the knowledge and science of palaeontology. Without mitigation options the possible fossils that will be exposed will be lost for study and adding to the knowledge base. However with mitigation during construction all the fossils exposed will be collected, studied and curated. This will then help in adding to the palaeontological knowledge of the area. These fossils would never have been seen or recorded if not for the mitigation work and construction activity. This stresses the importance of implementation of the mitigation measures for the palaeontology during the construction.

Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	1
Cumulative impact is seen as low and only localised to the western entrance of the tunnel	
Degree of potential irreplaceable loss of resources	2
The impact may result in the irreplaceable loss of palaeontological resources however the collection of fossils already completed as well as collection of fossils during construction will result in a positive impact.	
Prioritisation Factor	1,17
Final Significance	4,67

Impact Name	**Destruction of graves (OT 02)**				
Alternative	**Temporary construction camp**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	5	1
Duration of Impact	5	2	Probability	5	1
Environmental Risk (Pre-mitigation)					-20,00
Environmental Risk (Post-mitigation)					-1,25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					

Degree of potential irreplaceable loss of resources	3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).	
Prioritisation Factor	1,67
Final Significance	-2,08

Impact Name	**Destruction of graves (OT01)**				
Alternative	**Original stockpile area**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	5	1
Duration of Impact	5	2	Probability	5	1
Environmental Risk (Pre-mitigation)					-20,00
Environmental Risk (Post-mitigation)					-1,25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1,67
Final Significance					-2,08

Impact Name	**Destruction of graves (OT03)**
Alternative	**Stockpile Area 1**

Phase	Construction				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	5	1
Duration of Impact	5	2	Probability	1	1
Environmental Risk (Pre-mitigation)					-4,00
Environmental Risk (Post-mitigation)					-1,25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1,50
Final Significance					-1,88

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

15. General (i.e. applicable to both the proposed tunnel site, and associated construction activities site (stockpile area and Laydown areas) alternatives:

- Demarcate heritage site as a no-go area and include a 50 meter buffer around the cemetery.

Impact Name	Destruction of graves (OT08 and 09)
Alternative	**Stockpile Area 2**
Phase	**Construction**
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	5	1
Duration of Impact	5	2	Probability	3	1
Environmental Risk (Pre-mitigation)					-12,00
Environmental Risk (Post-mitigation)					-1,25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1,50
Final Significance					-1,88

Impact Name	**Destruction of farmstead (OT04-07)**				
Alternative	**Stockpile Area 2**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	5	1
Duration of Impact	5	2	Probability	3	1
Environmental Risk (Pre-mitigation)					-12,00

Environmental Risk (Post-mitigation)	-1,25
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).	
Prioritisation Factor	1,50
Final Significance	-1,88

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

16. General (i.e. applicable to the proposal and associated construction activities):

- The EAP and ECO be informed of the fact that a Medium Paleontological sensitivity is allocated to the western part of the development where plant and trace fossils are associated with sandstone and shale of the Vryheid Formation. If significantly well-preserved fossils are recorded, these finds must be reported to SAHRA and rescued be a qualified palaeontologist;
- All recorded fossils must be rescued according to SAHRA specifications;
- The first option of redesigning the temporary construction area to exclude this cemetery from the foot print area must be considered; and
- If this option is found not to be feasible, a grave relocation process must be initiated. This process must comply with the provisions and regulations of Section 35 and 36 of the National Heritage Resources Act (Act No 25 of 1999); Regulations 363 of The Health Act (Act No 61 of 2003); Mpumalanga Cemeteries, Crematoria and Exhumation of Bodies Act, 2005 (Act No. 8 of 2005).

Alternative Specific (i.e. applicable to preferred stockpile alternative areas)

- Demarcate identified heritage site as a no-go area and include a 50 meter buffer around the cemetery.
- If this option is found not to be feasible, a grave relocation process must be initiated. This process must comply with the provisions and regulations of Section 35 and 36 of the National Heritage Resources Act (Act No 25 of 1999); Regulations 363 of The Health Act (Act No 61 of 2003); Mpumalanga Cemeteries, Crematoria and Exhumation of Bodies Act, 2005 (Act No. 8 of 2005)

- In the event that that a redesign and safety buffer is not possible for the homesteads, an extensive documentation of the farmstead and structures that include, site layout sketches, excavations and detailed photographic recording will be required.
- A destruction permit for the homestead site can then be lodged with the Mpumalanga Provincial Heritage Authority.

9.4.1.16. DESTRUCTION OF SPECIES OF CONCERN

During the construction phase, the presence of the construction crew increases the risk that species with medicinal or economical value (bushmeat) will be harvested or poached beyond the activity footprint. Both heavy and light machinery vehicles during construction will be moving around, the movement of these vehicles beyond the development footprint will result in the destruction of habitat for both flora and fauna, as well increase the risk of erosion. This potential impacts can be avoided or mitigated through the effective implementation of an Environmental Management Plan by a qualified Environmental Control Officer, which state that no off-road driving is allowed for any vehicle whether heavy or light beyond the demarcated development footprint and related infrastructure.

Impact Name	**Destruction of species of concern (Red Data, protected) or suitable habitat for them**				
Alternative	**Proposal**				
Phase	**Planning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	1	Magnitude of Impact	4	1
Extent of Impact	3	4	Reversibility of Impact	5	2
Duration of Impact	5	5	Probability	5	4
Environmental Risk (Pre-mitigation)					-21.25
Environmental Risk (Post-mitigation)					12.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					14.00

Impact Name	**Harvesting of medicinal plants or poaching of bush meat**
Alternative	**Proposal**
Phase	**Construction**
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	1	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-3.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4.08

Impact Name	**Off road driving beyond the development footprint**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	1	Reversibility of Impact	2	2
Duration of Impact	2	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-6.75
Environmental Risk (Post-mitigation)					-3.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-3.50

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

17. General (i.e. applicable to the proposed project associated construction activities:

- The footprint/s of the development site/s should be fenced off.

- An environmental monitoring level aerial photograph should be taken of the footprint and surrounding areas, minimum 300 m buffer/ radius. This should be repeated two monthly to enable the early detection of activities (harvesting, tracks – vehicle or human, spread or establishment of alien invasive species, erosion) outside the relevant development footprint. The same image can be used to evaluate the vegetation health in the rehabilitated/ re-vegetated areas;
- Harvesting of medicinal plants and/ or wildlife without the relevant permits are a contravention of the relevant acts such as the Mpumalanga Conservation Act and will result in prosecution and dismissal of any person found guilty of harvesting of plants or killing of wildlife;
- Implement a suitable buffer zone around the wetlands; take cognisance of recommendations from the wetland report;
- Prevent contamination of natural grassland and wetlands from nearby stockpiling, laydown areas, or any other source of pollution;
- Compile a graphic list of potentially dangerous animals and present this to all workers as part of site induction.
- Where the proposed infrastructure whether linear (roads) or non-linear (temporary or permanent) will be placed on natural primary vegetation, the following aspects should be assessed prior to the commencement of the construction activities;
- The presence of flora species of concern (Red Data, protected – nationally and provincial, alien invasive species) needs to be confirmed and their population dynamics (density and age) be assessed to assist with the application for permits in terms of the relevant legislation, whether provincial or national, where relevant. A registered professional ecologist specialising in vegetation science should facilitate these studies during the optimal flowering period from November/ December to February/ March;
- Movement of the workforce should be restricted to the construction site;
- No open fires should be allowed, as runaway veldfires will be significant risk during the winter months, especially from June to September; and
- Careful creation of firebreaks with specific relevance to the National Veld and Forest Fire Act (No 101 of 1998) requirements.

9.4.1.17. IMPACT ON INDIGENOUS NATURAL VEGETATION

Construction of infrastructure may lead to direct loss of vegetation. This will lead to localised or more extensive reduction in the overall extent of vegetation. Where this vegetation has already been stressed due to degradation and transformation at a regional level, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat and a change in the conservation status (current conservation situation). Consequences of the impact occurring may include:

- Negative change in conservation status of habitat (Driver et al. 2005);
- Increased vulnerability of remaining portions to future disturbance;
- General loss of habitat for sensitive species;
- Loss in variation within sensitive habitats due to loss of portions of it;
- General reduction in biodiversity;
- Increased fragmentation (depending on location of impact);
- Disturbance to processes maintaining biodiversity and ecosystem goods and services; and
- Loss of ecosystem goods and services.

The proposed project falls within proximity to the Eastern Highveld Grassland and Wakkerstroom Montane Grassland Biomes. These biomes are classified as Endangered and Least Threatened respectively in the scientific literature (Mucina & Rutherford, 2006).

Impact Name	**Transformation of natural vegetation/ habitat**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	1	Magnitude of Impact	4	3
Extent of Impact	3	1	Reversibility of Impact	3	2
Duration of Impact	5	1	Probability	5	4
Environmental Risk (Pre-mitigation)					-18.75
Environmental Risk (Post-mitigation)					7.00[5]
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17

[5] . The mitigation is to place the spoils on already transformed areas, thereby reducing the need to transform additional natural areas, which results in a positive impact.

Final Significance	8.17

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

18. General (i.e. applicable to the proposed project site and associated construction activities;

- Detailed rehabilitation plans need to be compiled for all primary natural vegetation areas to be affected during the construction activities. The detailed rehabilitation plan should make provision for a nursery where plants which can be transplanted such as geophytes (bulbs) and/ or seedlings be maintained or propagated depending on the nature of the species required;
- Management of the topsoil in these primary natural vegetation areas are critical, as they contain the seedbed for re-establishing the vegetation post construction, where structures are going to be placed which will not allow light and water to penetrate the soils;
- The topsoil should be removed and stored until such time that the infrastructure can be removed.
- Compaction of the topsoil should be avoided, once again the topsoil should rather be removed and disturbance should occur on the subsoils;
- A registered professional soil scientist/ pedologist should assess the nature of the soils and compile relevant management requirements thereof, before any construction activities commence.
- The detail rehabilitation plan should state the frequency and duration of monitoring required, and the criteria against which the areas will be considered to be successfully rehabilitated; and
- A road management plan should be compiled prior to the commencement of construction activities.

9.4.1.18. IMPACT ON WETLANDS

According to the ecological importance classification for the two quaternary catchments (C11B and W53A) in the area, the systems can be classified as sensitive to moderately sensitive in terms of ecological importance and sensitivity which, in their present state, can be considered to be Class B (minimally modified) streams and Class C (moderately modified) streams based on the certainty of desktop methods (Kleynhans, 1999).

Construction may lead to some direct or indirect loss of, or damage to, wetlands or drainage lines, or impacts that affect the catchment of these wetlands. This could lead to localized loss of wetland habitat and may lead to downstream impacts that affect a greater extent of wetlands or impact on wetland function. Where these habitats are already stressed due to degradation and transformation, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat. Physical alteration to wetlands can have an impact on the functioning of those wetlands. Consequences may include:

- Increased loss of soil;
- Loss of or disturbance to indigenous wetland vegetation;

- Loss of sensitive wetland habitats;
- Loss or disturbance to individuals of rare, endangered, endemic and/or protected species that occur in wetlands;
- Fragmentation of sensitive habitats;
- Impairment of wetland function;
- Change in channel morphology in downstream wetlands, potentially leading to further loss of wetland vegetation; and
- Reduction in water quality in wetlands downstream of infrastructure.

The area surrounding the proposed project contains significant areas protected by law under the NWA and it is essential that the exact location and sensitive of these systems which occur in close proximity to the proposed project are determined. An understanding of the location and sensitivity of surrounding wetlands is required to ensure that mitigation measures can be put in place to avoid and/or reduce potential impacts. There is also a legal obligation to apply for a WUL for any wetlands that may be affected by the proposed project.

Impact Name	**Loss of Watercourse Habitat**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	4
Extent of Impact	2	1	Reversibility of Impact	5	4
Duration of Impact	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-20.00
Environmental Risk (Post-mitigation)					-16.25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					2
Issue has received a meaningful and justifiable public response					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1.67
Final Significance					-27.08

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

19. General (i.e. applicable to the proposed project site and associated construction activities):

- Move proposed development footprints outside of watercourses and their associated 50m buffer as far as practically possible;
- Linear crossings that cannot be moved should be located a close as possible to existing infrastructure (e.g. existing rail lines and access roads); and
- Reduce the overlap in areas where overlap avoidance is not possible; Target more impacted watercourses (watercourses with a lower PES and EIS classes) where overlap cannot be avoided.

Impact Name	**Erosion and desiccation of watercourses**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	1	1	Reversibility of Impact	3	2
Duration of Impact	5	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-12.00
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-6.00

Impact Name	**Groundwater contamination**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	3	1	Reversibility of Impact	4	3

Duration of Impact	2	2	Probability	4	3
Environmental Risk (Pre-mitigation)					-13.00
Environmental Risk (Post-mitigation)					-6.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					2
Issue has received a meaningful and justifiable public response					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-8.00

Impact Name	**Surface water contamination (as a secondary effect to groundwater contamination)**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	2	3	Probability	4	2
Environmental Risk (Pre-mitigation)					-12.00
Environmental Risk (Post-mitigation)					-6.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-8.00

Impact Name	**Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)**
Alternative	**Proposal**

Phase	Construction				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					2.00
Final Significance					-15.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

20. General (i.e. applicable to the proposed project and associated construction activities):

- Move linear access road crossing outside of demarcated watercourses where possible; Prevent the use of narrow culverts and/or pipes in road and rail crossings. Flows should be spread out across the width of the affected watercourse;
- Ensure that energy dissipation and scour control features are constructed below culverts and pipe outlets;
- Design and implement a series of flow barriers (e.g. concrete weirs) at regular intervals in the cut-off drain/channel section in un-channelled valley bottom, north of the rail. This should be done to increase the water level within the channel, which will reduce the desiccation effect around the cut-off drain. Divert water out of the cut-off channel behind the weirs using spreader channels that will release water at regular intervals along the cut-off drain, rather than discharging all of the diverted water at a single point at the end of the drain;
- Release of water in a spread out patter along contour lines will help to rewet desiccated wetland habitat in the northern half of Un-channelled valley bottom; and
- Ensure that as far as practicable, waste oil is collected, stored and disposed of by accredited vendors for recycling;

- Measures shall be implemented and recorded to minimize the contamination of waste oil; Oil recovered from machinery is stored in a clearly labelled container and within secondary containment;
- On-going campaigns are conducted to sensitize staff not to dispose of any oil into the storm or effluent tunnel drains, or into a dedicated container allocated to a different material; Conduct monthly inspections of waste oil disposal performance;
- Ensure that the setting ponds and basic drain systems are constructed before the actual tunnelling process starts;
- According to DWS 2004 Guideline document for protecting springs; "DWS only recommend that a minimum of 100m No-Go zone around springs be created in order to prevent spring water contamination. DWS also recommended that all contamination activities within such a 100m No-Go zones tried to be restricted or other ways moved outside of the zone to protect the spring;
- Start monitoring of spring's water qualities before construction, and monthly during construction. Springs water quality around the material stockpiling area/s must be monitored on a monthly base as well; and
- Relevant mitigation measures are discussed in the Hydrogeological Impact Assessment Report; these include the following:
    - During tunnel construction caution must be taken to select the appropriate tunnelling method and appropriate charge level not to cause further increase in bedrock fracturing or to increasing the hydraulic conductivity between shallow weathered and deeper fractured bedrock aquifers. This will help reduce the risk of impacting the groundwater levels of weathered aquifer which sustain spring flow and groundwater dependent wetlands. This will assist in reducing inflows into the tunnel as well as the extent of the drawdown radius of influence.
    - Groundwater bearing faults and fracture zones within the tunnel area must be sealed off to reduce groundwater inflow and groundwater contamination.

9.4.1.19. ESTABLISHMENT AND SPREAD OF LISTED INVASIVE PLANT SPECIES

Major factors contributing to invasion by alien invader plants includes high disturbance, negative grazing practices and deforestation. Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003). Consequences of this may include:

- Loss of indigenous vegetation;
- Change in vegetation structure leading to change in various habitat characteristics;
- Change in plant species composition;
- Change in soil chemical properties;

- Loss of sensitive habitats;
- Loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
- Fragmentation of sensitive habitats;
- Change in flammability of vegetation, depending on alien species;
- Hydrological impacts due to increased transpiration and runoff; and
- Impairment of wetland function.

Alien invasive plant species are currently present within the landscape, especially within, and in-close proximity, of the existing rail and tunnel infrastructure. Therefore the risk exists that seeds from these species could spread on the vehicles or through the indiscriminate use of soil from these areas throughout the development footprint.

Impact Name	**Alien invasive species**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	1	Magnitude of Impact	3	1
Extent of Impact	3	4	Reversibility of Impact	4	1
Duration of Impact	5	4	Probability	5	3
Environmental Risk (Pre-mitigation)					-18.75
Environmental Risk (Post-mitigation)					7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					8.75

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

21. General (i.e. applicable to the both the proposed project (Tunnel), and associated construction activities:

- The construction site should be monitored for the establishment of alien invasive species and they should be eradicated once they have been observed;
- No soil from areas infested with alien invasive species can be used in landscaping and rehabilitation.
- Alien infested topsoil stockpiles should be monitored and any alien invasive species eradicated once they have been identified; and

- The alien invasive management plan should be compiled and executed under the supervision of a registered professional vegetation scientist.

9.4.1.20. SEDIMENTATION

Construction activities have the potential to increase exposed surface which in turn can increase local and regional sediment loads in surface water resources. This may be especially prevalent during high rainfall events. Increased sediment loads in local surface water resources can affect sun penetration, water temperature, and available oxygen to aquatic environments. This impact is of specific relevance to the construction of the proposed project as a large area is required for excavation material. The probability and magnitude of this impact is dependent to a large extent on the proximity of the construction camps/s to the receiving water resources and as such will need to be considered relative to each potential location of ancillary activities.

Impact Name	**Sediment runoff and increased suspended solids**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	5	2
Duration of Impact	2	1	Probability	5	2
Environmental Risk (Pre-mitigation)					-16.25
Environmental Risk (Post-mitigation)					-3.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.50
Final Significance					-5.25

9.4.1.21. POLLUTION/ CONTAMINATION OF WATER RESOURCES

Water resource refers to both surface water and ground water. During construction certain hazardous substances will be utilized (e.g. fuels, oils, pesticides, herbicides, sewage, etc.). If not correctly controlled, these substances can inadvertently enter the local and regional water resources.

The removal of vegetation and topsoil, as well as the compaction of surfaces during construction, will result in increased runoff and erosion from the site, particularly given the steep slopes and rainfall in the area. Further, erosion potential exists where excavated topsoil is not appropriately stockpiled, i.e. stockpile walls are too steep and/or too high.

Runoff with higher sediment loads and the higher flood peaks will report to the local water courses. Soil erosion is expected to have a negative effect with a medium significance rating as the scale of the impact will be restricted to the site. If sediment control mitigation is put in place then the impact will rank as low.

During the construction phase, the spillage of oils, fuel and chemicals can result in the pollution of water resources if due care is not taken. The unmitigated impact is ranked as medium. In the ranking it has been assumed that the recommended design basis is followed and the required spillage protection is provided. If the recommended construction protocols are followed, then impact during construction will be reduced to low.

The construction of the crossings will alter the river banks and the river bed. There is the potential for erosion downstream of the crossings, backwater upstream of the crossings and erosion at the entrance to the crossing structures. The unmitigated impact is ranked as medium. In the ranking it has been assumed that the recommended design basis is followed, and the required erosion protection is provided. If the recommended construction protocols are followed, then the impact during construction will be reduced to low.

It has been identified that the excavation of the tunnel will most likely include some carboniferous materials. These materials pose a leachate hazard and consequently need to be separated from the remaining excavated materials and responsibly managed.

Impact Name	**Pollution/ contamination of water resources**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	1	Reversibility of Impact	4	4
Duration of Impact	3	2	Probability	5	4
Environmental Risk (Pre-mitigation)					-16.25
Environmental Risk (Post-mitigation)					-9.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1

The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.33
Final Significance	-12.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

22. General (i.e. applicable to the both the proposed project (Tunnel), and associated construction activities:

- Ensure that as far as practicable, waste oil is collected, stored and disposed of by accredited vendors for recycling;
- Measures shall be implemented and recorded to minimize the contamination of waste oil; Oil recovered from machinery is stored in a clearly labelled container and within secondary containment; and
- On-going campaigns are conducted to sensitize staff not to dispose of any oil into the storm or effluent drains, or into a dedicated container allocated to a different material;
- Conduct monthly inspections of waste oil disposal performance;
- The use of standard erosion control measures, such as interception drains, contour planting, silt fences, establishment of groundcover species, optimal drainage construction, and silt ponds are applied where appropriate;
- Where possible earthwork activities should be undertaken during dry periods;
- Care must be taken to identify carboniferous rock that is removed during excavations. Such rock must be stored separately, for as short a time as reasonably possible, to the remaining excavated materials and disposed of at a suitably authorised facility. Measures must be implemented to ensure that the stored material does not contaminate soil or water resources;
- Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff;
- Traffic and movement over stabilised areas will be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the Environmental Manager; and
- The total footprint area to be developed will be kept to a minimum by demarcating the construction areas and restricting construction to these areas only.

9.4.1.22. ALTERATION OF WATERCOURSE DYNAMICS

According to the farmers in the area the existing tunnel collects most of the surface water from the vicinity of the tunnel and surrounding properties and pumps it to the eastern end of the tunnel near Sheepmoor, thereby leaving the western area with little or no water for their use. The construction of the proposed project may necessitate alteration to the local topography. This may in turn alter flow velocity, volumes, and the nature of local drainage patterns. It may also impact on the dynamics of the receiving water resources. This is specifically relevant during high rainfall events. The probability and magnitude of this impact is dependent to a large extent on the proximity of the construction sites to the receiving water resources and on the nature of the receiving topography.

Impact Name	Alteration of water resource dynamic				
Alternative	Proposal				
Phase	Construction				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	5	4
Duration of Impact	5	5	Probability	5	3
Environmental Risk (Pre-mitigation)					-20.00
Environmental Risk (Post-mitigation)					-10.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.83
Final Significance					-19.25

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

23. General (i.e. applicable to the both the proposed project (Tunnel), and associated construction activities:

- All water bearing fractures within the tunnel must be sealed and grouted off to prevent groundwater inflows into tunnel;
- Monitoring of streams flow and groundwater levels a month before construction starts and monthly during construction. The following specific boreholes should be monitored:
    - Shallow Percussion Boreholes: PH01S, PH04S, PH05S & PH06S.
    - Deep Percussion Boreholes: PH01D, PH02, PH03, PH04D, PH05D, PH06D, PH07D.
    - Private groundwater abstraction borehole: OHP7, OHP8, OHP9 & OHP12. and
- Ensure that energy dissipation and scour control features are constructed below culverts and pipe outlets.

Impact Name	Erosion				
Alternative	Proposal				
Phase	Construction				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**

Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	1	Reversibility of Impact	5	4
Duration of Impact	3	2	Probability	5	4
Environmental Risk (Pre-mitigation)					-16.25
Environmental Risk (Post-mitigation)					-9.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1.50
Final Significance					-13.50

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

24. General (i.e. applicable to the both the proposed project (Tunnel), and associated construction activities:

- The use of standard erosion control measures, such as interception drains, contour planting, silt fences, establishment of groundcover species, optimal drainage construction, and silt ponds are applied where appropriate. Where possible earthwork activities should be undertaken during dry periods;
- Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff;
- Traffic and movement over stabilised areas will be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the Environmental Manager; and
- The total footprint area to be developed will be kept to a minimum by demarcating the construction areas and restricting construction to these areas only.

Impact Name	**Loss of vegetative cover**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	1
Extent of Impact	2	1	Reversibility of Impact	3	2
Duration of Impact	2	1	Probability	5	5
Environmental Risk (Pre-mitigation)					-12.50
Environmental Risk (Post-mitigation)					-6.25

Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.00
Final Significance	-6.25

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

25. General (i.e. applicable to the both the proposed project (Tunnel), and associated construction activities:

- To avoid additional transformation of natural vegetation and potential habitat for species of concern it is strongly recommended that the construction related infrastructure be placed on existing transformed areas, e.g. cultivated lands
- Prevent contamination of natural grassland and wetlands from nearby stockpiling, laydown areas, or any other source of pollution.
- Compile a graphic list of potentially dangerous animals and present this to all workers as part of site induction.
- Where the proposed infrastructure whether linear (roads) or non-linear (temporary or permanent) will be placed on natural primary vegetation, the following aspects should be assessed prior to the commencement of the construction activities.

9.4.1.23. IMPACTS OF WATER USE ON RESOURCE SUSTAINABILITY

The construction process may require large volumes of water for general consumption, dust suppression, wash bays, firefighting, etc. The proposed project is isolated from available municipal supplies and as such water required on site is likely to be obtained from local water resources. These water sources can be either, surface water, or groundwater (boreholes). It is anticipated that many of the existing landowners have access to existing boreholes which could be utilized during construction. It is understood that DWS may allow the Applicant to utilise a portion of the registered water user's allocation, subject to the necessary approval from DWS and a written agreement with the registered water user from a registered borehole. The abstraction of water from local water resources may have a negative impact on the sustainability of supply from these water resources and as such may negatively impact on other water users.

Impact Name	**Impacting production boreholes OHP7, OHP8 & OHP9, and spring OHP11.**
Alternative	**Proposal**

Phase	Construction				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	2	1	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	3	2
Environmental Risk (Pre-mitigation)					-11.25
Environmental Risk (Post-mitigation)					-6.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.50
Final Significance					-9.75

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

26. General (i.e. applicable to the proposed project (Tunnel), and associated construction activities:

- Water for the purposes of construction must be obtained from approved and, where relevant, licensed sources (e.g. Msukaligwa Local Municipality).
- A water conservation and management plan (WCMP) must be prepared prior to commencement of construction.
- Site staff shall not be permitted to use any stream, river, other open water body or natural water source adjacent to or within the designated site for the purpose of bathing, washing of clothing or for any construction or related activities. Municipal water (or another legal source approved by the Engineer) should instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting etc.
- One month before construction starts, perform a Specific Capacity Test on all the private abstraction boreholes (OHP7, OHP8, OHP9 & OHP12);
- Directly after construction perform a second Specific Capacity Test on the private abstraction boreholes (OHP7, OHP8, OHP9 & OHP12) and compare results to determine if any yield reduction or impacts have occurred on the private groundwater water users;

- One month before construction starts measure the spring flow rates for (OHP5, OHP10, OHP11 & OHP18). Thereafter continue to monitor the spring flow rates on a monthly bases; and In the case that an private groundwater abstraction borehole have been impacted upon by the construction phase (other by yield reduction, collapse or borehole water contamination);
- Transnet shall compensate the owner as agreed between the two parties.
- All water users should be appropriately licensed.

Impact Name	**Groundwater contamination**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	3	1	Reversibility of Impact	4	3
Duration of Impact	2	2	Probability	4	3
Environmental Risk (Pre-mitigation)					-13.00
Environmental Risk (Post-mitigation)					-6.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					2
Issue has received a meaningful and justifiable public response					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-8.00

Impact Name	**Surface water contamination (as a secondary effect to groundwater contamination)**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	2	3	Probability	4	2
Environmental Risk (Pre-mitigation)					-12.00
Environmental Risk (Post-mitigation)					-6.00

Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.	
Prioritisation Factor	1.33
Final Significance	-8.00

Impact Name	**Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					2.00
Final Significance					-15.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

27. General (i.e. applicable to the both the proposed project (Tunnel), and associated construction activities:

- Ensure that as far as practicable, waste oil is collected, stored and disposed of by accredited vendors for recycling;

- Measures shall be implemented and recorded to minimize the contamination of waste oil; Oil recovered from machinery is stored in a clearly labelled container and within secondary containment;
- On-going campaigns are conducted to sensitize staff not to dispose of any oil into the storm or effluent tunnel drains, or into a dedicated container allocated to a different material; Conduct monthly inspections of waste oil disposal performance;
- Ensure that the coal fine trap and basic drain systems are constructed before the actual tunnelling process starts;
- According to DWS 2004 Guideline document for protecting springs; "DWS only recommend that a minimum of 100m No-Go zone around springs be created in order to prevent spring water contamination. DWS also recommended that all contamination activities within such a 100m No-Go zones tried to be restricted or other ways moved outside of the zone to protect the springs;
- Start monitoring of spring's water qualities before construction, and monthly during construction. Springs water quality around the material stockpiling area/s must be monitored on a monthly base as well; and
- Relevant mitigation measures are discussed in the Hydrogeological Impact Assessment Report; these include the following:
  - During tunnel construction caution must be taken to select the appropriate tunnelling method and appropriate charge level not to cause further increase in bedrock fracturing or to increasing the hydraulic conductivity between shallow weathered and deeper fractured bedrock aquifers. This will help reduce the risk of impacting the groundwater levels of weathered aquifer which sustain spring flow and groundwater dependent wetlands. This will assist in reducing inflows into the tunnel as well as the extent of the drawdown radius of influence.
  - Groundwater bearing faults and fracture zones within the tunnel area must be sealed off to reduce groundwater inflow and groundwater contamination.

9.4.1.24. IMPACT OF VIBRATION

The vibration sensitive areas in the study area according to the Vibration specialist are; the residential areas surrounding the site and the AFGRI grain silo office to the west. Even though the vibration levels are most probably below any problematic levels, it is recommended that mitigation suggested below be implemented.

Impact Name	**Vibrations**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1

Extent of Impact	3	3	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	5	3
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
Final Significance					-4.50

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

28. General (i.e. applicable to the both the proposed project (Tunnel), and associated construction activities:

- Vibration sensors be installed for the test blasting, and then remain for the duration of the blasting. These levels must be monitored on a regular basis to ensure that the blasting levels are not exceeding the safe levels;
- It is crucial that Transnet arrange a qualified engineer to inspect all buildings identified in this report for damage, as well as the N2 freeway directly above the tunnel line. The N2 must be continuously inspected while the tunnel is being dug underneath the road;
- The qualified engineer must at the end of the construction process re-inspect the buildings and road to confirm that there has not been any damage, or to list the damage and required remedial action. If damage occurred, an assessor needs to be appointed to evaluate the damage and to determine compensation.
- If there are any complaints from any residents or AFGRI that the blasting has caused damage then the engineer's report and the vibration monitoring data will be used to determine whether the complaint is valid or not.

9.4.1.25. WASTE MANAGEMENT AND DISPOSAL

The construction of the tunnel will result in the generation and accumulation of significant quantities of waste rock and excavated materials. Based on basic calculations it is anticipated that approximately 1 000 000m^3 of rock will be excavated and disposed of.

The contractor should be responsible to ensure the waste is collected and disposed of properly and that appropriate measures are taken to minimise adverse impacts such as dust generation. Considering the volumes of the material likely to be excavated for this proposed project, there may be a need to pursue certain or all of the alternatives presented in this section with regard to waste.

The following alternatives applicable to handling and management of waste rock and associated material will be investigated and implemented during construction.

1. Stockpiling of all rock waste removed from the tunnel excavation, undertake rehabilitation and blend with the surrounding environment.

Other wastes material that will be generated as a result of the construction process will typically include:

2. Solid wastes (construction debris, inert materials-overburden, cement bags, wrapping materials, timber, cans, wire, nails, food, and other organic wastes, etc.); and

3. Liquid wastes (oil, paint, sewage, fuel, etc.).

The management of waste will be applicable throughout the construction process. The significance of this impact is anticipated to be dependent on the final location selected for temporary storage of waste rock. The significance of this impact can generally be mitigated through the implementation or management measures in an EMPr. It is recommended that a separate waste management plan be prepared for the proposed site during construction, for proper management of all produced waste.

Impact Name	**Waste management**				
Alternative	**Proposal**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	3	1
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-2.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1

The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-2.33

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

29. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities::

- Receptacles with suitable covers shall be provided and conveniently placed. All the receptacles will be removed from the site for disposal at a commercial facility licensed for this purpose;
- Unutilised, construction materials are to be removed once construction has ended, e.g. crushed stone may not be left or randomly strewn around the site. The materials may be left if they are to be removed from the site to be used by the local people or suitably used for road maintenance with the approval of the ECO, and must be removed prior to the Contractor vacating site. No waste shall be left in the veld or anywhere around the site;
- A Waste Management Plan (WMP) must be prepared and implemented throughout construction. This Plan must include measures for waste sorting for the purpose of recycling where feasible. The WMP must include a water conservation and management plan which should aim to reduce, and re-use water where possible;
- Wastes must be disposed of at suitably licensed waste disposal facilities; and
- Construction sites must be kept clear of litter and good housekeeping must be implemented.

Alternative Specific (i.e. applicable to preferred stockpile alternative areas (1 or 2 or 5 or 11 or 20 or 21 or Original area and Laydown Sites Alternatives):

- A selection of suitable indigenous vegetation should be planted on the stockpile during rehabilitation in order to blend the area with the surrounding environment; and
- Stockpile should sized in a manner that reduce visual intrusion to the surrounding residents, tourists and road users travelling along N2.

9.4.2. OPERATIONAL PHASE

9.4.2.1. IMPACT ON SENSE OF PLACE

The operation of the proposed project is not anticipated to significantly impact on the sense of place because the same land use already exists as a result of the existing tunnel and railway line. Except for the visual intrusion from the stockpile areas to the surrounding receptors, (e.g. guest house, farmsteads, AFGRI, road users, etc) majority of the proposed project activities during operation will be underground and therefore not a significant visual intrusion to the surrounding receptors

With reference to FIGURE 43, visual exposure from preferred stockpile site is not anticipated to be of significance concern. Only few receptors are located in close proximity to the site and since it is assumed that the stockpile sites will be rehabilitated during operational phase, visual intrusion is therefore not anticipated to be of significant concern.

Alternative area 1 and 5 are situated approximately 100m of the AFGRI storage facilities and approximately 1000m of the Overvaal Guest house respectively. It is therefore anticipated that visual intrusion will be high from the AFGRI facility if alternative area 3 and 5 are preferred for stockpiling.

Stockpile alternative area 20 and 21 if preferred will have visual impact to the N2 road users since their boundaries towards the east borders the N2 national road. Other sensitive residential receptors are not within close proximity (<900m) to alternative area 20 and 21. Those include small settlements situated towards the eastern part of the stockpile areas, farmsteads buildings and Overvaal guest house that are situated towards the North West of the stock pile area 20 and 21. Farmstead to the North of the proposed project site is located approximately 2000m of the alternative area 20 and 21 respectively.

Stockpile alternative area 2 closest sensitive visual receptors will be the road users and small settlement that are both situated approximately 1500m towards the east.

Stockpile alternative area 11 closest visual receptors will be the road user together with both the small settlement and farmstead situated approximately 1600m away.

Impact Name	**Sense of place**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	3	2
Duration of Impact	3	2	Probability	3	3
Environmental Risk (Pre-mitigation)					-8.25
Environmental Risk (Post-mitigation)					-6.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-7.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

30. General (i.e. applicable to the both the proposed project (Tunnel), and associated construction activities:

- Stockpile should be sized in a that to reduce visual intrusion to the surrounding residents, tourists and road users travelling along N2;
- A selection of suitable indigenous vegetation should be planted on the stockpile during rehabilitation in order to blend the area with the surrounding environment;
- Materials and equipment should be placed away from the any water body or drainage lines;
- Once the construction activities had stopped and all the elements of the construction activity had been removed and rehabilitated and the tunnel had become operational, then the responsibility continues to monitor and eradicate alien invasive species in areas under Transnet's jurisdiction including stockpile areas; and
- Specific period should be allowed for natural rehabilitation on waste rock stockpile areas and thereafter monitor properly. Based on monitoring, if necessary undertake full rehabilitation process.

Impact Name	**Noise pollution**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	3	3	Reversibility of Impact	1	1
Duration of Impact	5	5	Probability	3	3
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
Final Significance					-7.50

9.4.2.2. IMPACT ON CURRENT LAND-USE

The construction of the proposed project will not compromise the possibility for alternative land-uses within the designated footprint except for the service servitude that needs to be fenced off. The exact location of the proposed project route will need to be considered in order to ensure that the surrounding land-uses are not directly impacted upon (e.g. locating the new tunnel far away from the existing tunnel will require additional land to be fenced off for service roads and maintenance purposes). The physical land to be permanently disturbed (as opposed to temporary construction activities) by the proposed project will be limited since the facility will be underground, which will allow land uses to still continue above ground.

Impact Name	**Impact on current land use**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	2	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-4.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-5.33

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

31. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities::

- Ensure timeous communication with landowners and local emergency services prior to planned maintenance works;
- Demarcate the site and keep within the Transnet servitude;

- Accidental damage to farming equipment and infrastructure caused by the project, including loss of crops, must be dealt with according to Transnet internal procedure;
- After construction, any area cleared or disturbed (as a result of the activity) within and outside the boundaries of the construction site shall be rehabilitated to the pre-construction state; and
- All disturbed areas must be rehabilitated to the pre-construction condition or alternatively to align with the surrounding land-uses at the time. All rehabilitated areas must be protected and monitored for progress.

9.4.2.3. POLLUTION AND ALTERATION OF WATERCOURSE DYNAMICS

The proposed project will consist of a large area where the local topography will be altered and the localised drainage patterns altered. This has the potential to result in greater surface and stormwater runoff towards the lower end of the tunnel. This could in turn alter the current flow regime within the local river systems. According to the farmers in the area the existing tunnel collects most of the surface water from the vicinity of the tunnel and surrounding properties and releases it to the eastern end of the tunnel near Sheepmoor thereby leaving the western area with little or no water for their use.

The following risk levels are anticipated during the operation phase of the proposed project:

- Medium risk will continue to exist for lowering and maintaining of lowered groundwater levels, due to that the tunnel draining effect which will continue until steady state flow system is reached. At steady state condition the groundwater levels should remain at this lowered level throughout the operational and decommissioning phases.
- Low risk exists for groundwater and surface water contamination within the tunnel area due to the separation of clean water from contaminated water within the tunnel drain systems.

Impact Name	**Pollution and alteration of water resource dynamic**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	5	4
Duration of Impact	5	5	Probability	5	3
Environmental Risk (Pre-mitigation)					-20.00
Environmental Risk (Post-mitigation)					-9.75
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					

Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.	
Prioritisation Factor	1.67
Final Significance	-16.25

Impact Name	**Increase bedrock fracturing and opening of fractures / faults connecting the shallow weathered aquifer and deeper fractured bedrock aquifer (If drill and blast method is used)**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					2.00
Final Significance					-15.00

Impact Name	**Impacting production boreholes OHP7, OHP8 & OHP9, and spring OHP11.**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	5	5	Probability	3	2

Environmental Risk (Pre-mitigation)	-11.25
Environmental Risk (Post-mitigation)	-6.50
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	3
Issue has received an intense meaningful and justifiable public response	
Cumulative Impacts	1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.	
Prioritisation Factor	1.50
Final Significance	-9.75

Impact Name	**Surface water contamination (as a secondary effect to groundwater contamination)**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	4	3	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.00
Environmental Risk (Post-mitigation)					-6.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-8.00

Impact Name	**Erosion and Desiccation of Watercourses**
Alternative	**Proposal**
Phase	**Operation**
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	1	1	Reversibility of Impact	3	2
Duration of Impact	5	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-12.00
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-6.00

Impact Name	**Surface Water Contamination**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	1	Reversibility of Impact	4	3
Duration of Impact	3	2	Probability	4	2
Environmental Risk (Pre-mitigation)					-12.00
Environmental Risk (Post-mitigation)					-3.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4.08

Impact Name	Encroachment of Alien Plants				
Alternative	Proposal				
Phase	Operation				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	2
Extent of Impact	2	2	Reversibility of Impact	3	2
Duration of Impact	5	2	Probability	4	4
Environmental Risk (Pre-mitigation)					-15.00
Environmental Risk (Post-mitigation)					-8.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1.50
Final Significance					-12.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

32. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- Continue to monitor groundwater levels on a quarterly bases for the first year; Thereafter monitor annually for the next 3 years;
- Groundwater boreholes which should be monitored are:
  - Shallow Percussion Boreholes: PH01S, PH04S, PH05S & PH06S;
  - Deep Percussion Boreholes: PH01D, PH02, PH03, PH04D, PH05D, PH06D, PH07D;
  - Private groundwater abstraction borehole: OHP7, OHP8, OHP9 & OHP12;
- After the 4 years of monitoring, the groundwater level monitoring reports with all the groundwater monitoring date should be submitted to DWS for review and further recommendations on or if further groundwater monitoring is need;
- Springs water quality around the material stockpiling area/s must be monitored on a monthly base until end of construction as well;
- Move linear access road crossing outside of demarcated watercourses where possible;

- Prevent the use of narrow culverts and/or pipes in road and rail crossings. Flows should be spread out across the width of the affected watercourse;

9.4.2.4. POLLUTION OF WATER RESOURCES

The operation of the proposed project will require the use of hazardous substances, most notably, the use of oils and grease. Depending on the specifications of the oils the hazardous nature of these can vary. There is a risk that these hazardous substances can directly and indirectly enter the local environmental pathways, e.g. surface water, groundwater, and soils. Further the railway often collects debris and materials that fall from the rail cars (including coal dust and debris) which when mobilized into the stormwater system could potentially affect downstream water resources. This potential impact can be largely managed and mitigated through correct design and operation practices.

Impact Name	**Surface water pollution/ contamination**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	2	1	Reversibility of Impact	4	3
Duration of Impact	2	1	Probability	3	3
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-5.25

Impact Name	**Erosion and Desiccation of Watercourses**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2

Extent of Impact	1	1	Reversibility of Impact	3	2
Duration of Impact	5	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-12.00
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-6.00

Impact Name	**Surface Water Contamination**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	1	Reversibility of Impact	4	3
Duration of Impact	3	2	Probability	4	2
Environmental Risk (Pre-mitigation)					-12.00
Environmental Risk (Post-mitigation)					-3.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4.08

Impact Name	**Encroachment of Alien Plants**
Alternative	**Proposal**
Phase	**Operation**

Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	2
Extent of Impact	2	2	Reversibility of Impact	3	2
Duration of Impact	5	2	Probability	4	4
Environmental Risk (Pre-mitigation)					-15.00
Environmental Risk (Post-mitigation)					-8.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1.50
Final Significance					-12.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

33. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- Specific species that need to be actively evaluated and address are those already present within the study area and its surroundings, such as *Acacia dealbata, A. mearnsii, Populus xcanescens*, and Eucalyptus spp., while ruderal and agrestral weeds can be controlled via land use management actions, such as grazing and burning.

Impact Name	**Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3

Issue has received an intense meaningful and justifiable public response	
Cumulative Impacts	3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).	
Prioritisation Factor	2.00
Final Significance	-15.00

Impact Name	**Surface water contamination**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	2	1	Reversibility of Impact	4	3
Duration of Impact	2	1	Probability	3	3
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-5.25

Impact Name	**Sediment runoff and increased suspended solids**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	1	1	Reversibility of Impact	4	2
Duration of Impact	1	1	Probability	5	3

Environmental Risk (Pre-mitigation)	-8.75
Environmental Risk (Post-mitigation)	-3.75
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.33
Final Significance	-5.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

34. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- Maintain a surface water monitoring procedure.

9.4.2.5. LOSS OF LAND CAPABILITY (AGRICULTURAL POTENTIAL) AND DISRUPTION OF FARMING ACTIVITIES

All farming activities currently practiced in the vicinity of the proposed project are anticipated to be able to continue as no large surface land will be taken except for the stockpile areas and enclosed service road that already exists. Since the proposed project doesn't necessarily require the acquisition of large portions of surface land except for the stockpile areas, no significant amount of agricultural land is anticipated to be permanently lost.

Impact Name	**Loss of land capability**				
Alternative	**Proposal**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	2	Reversibility of Impact	3	2
Duration of Impact	2	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-4.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					

Degree of potential irreplaceable loss of resources	2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.	
Prioritisation Factor	1.33
Final Significance	-5.33

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

35. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- Where possible original land use (e.g. grazing, cultivation, etc) that was practiced prior to construction should be allowed to continue.

9.4.2.6. IMPACTS OF EROSION

Erosion may occur during the short, medium, and longer term of the operation of the proposed project specifically at the exits of the tunnel, as well as drainage and stormwater discharge points. It will be crucial to ensure that evidence of erosion is monitored on an ongoing basis and rectified where applicable. Soil erodibility (in respect of soil properties) in proximity to the proposed project is reported to be very low (Mucina & Rutherford, 2006), however considering that the receiving environment has high topographic variability, there are localised areas where erosion potential may be high.

Impact Name	**Erosion**				
Alternative	**Proposal and Stockpile area**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	1	1	Reversibility of Impact	5	3
Duration of Impact	2	1	Probability	5	4
Environmental Risk (Pre-mitigation)					-11.25
Environmental Risk (Post-mitigation)					-6.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-8.00

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

36. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff; and
- Traffic and movement over stabilised areas will be restricted and controlled, and damage to stabilised areas shall be repaired and maintained.

Impact Name	Control of alien invasive species				
Alternative	Proposal				
Phase	Operation				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	1	Magnitude of Impact	3	1
Extent of Impact	3	4	Reversibility of Impact	4	1
Duration of Impact	5	4	Probability	5	3
Environmental Risk (Pre-mitigation)					-18.75
Environmental Risk (Post-mitigation)					7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					8.75

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

37. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- Once the construction activities had stopped and all the elements of the construction activity had been removed and rehabilitated and the tunnel had become operational, then the responsibility continues to monitor and eradicate alien invasive species in areas under Transnet's jurisdiction in terms of the National Environmental Management Biodiversity Act and the Conservation of Agricultural Resources Act; and
- Should Transnet fail to comply with this legal requirement, then the area will most probably be invaded by alien invasive species, especially if the rehabilitation of the construction areas had been poorly done. These areas will then become source areas from which the alien invasive species can disperse into the surrounding landscape.

9.4.3. DECOMMISIONING PHASE

It is highly unlikely that the railway line and related tunnel infrastructure will be decommissioned, however on completion of the decommission activities e.g. closure of the tunnels, removal of the railway lines, those areas which cannot be converted to an alternative sustainable landuse e.g. roads, pipelines, will have to be rehabilitated/ re-vegetated using regionally indigenous species.

During decommissioning phase the following impacts were identified and assessed by various specialists:

9.4.3.1. HYDROGEOLOGICAL IMPACT ASSESSMENT

Impact Name	**Erosion and desiccation of Watercourses**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	1	1	Reversibility of Impact	3	2
Duration of Impact	2	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-8.00
Environmental Risk (Post-mitigation)					-3.75
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-5.00

Impact Name	**Surface Water Contamination**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	1	Reversibility of Impact	4	3
Duration of Impact	2	2	Probability	4	2

Environmental Risk (Pre-mitigation)	-11.00
Environmental Risk (Post-mitigation)	-3.50
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-4.08

Impact Name	**Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					2.00
Final Significance					-15.00

Impact Name	**Lowering and maintaining of lowered groundwater levels**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**

Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	2	Reversibility of Impact	5	4
Duration of Impact	5	5	Probability	2	3
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-9.75
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.67
Final Significance					-16.25

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Impact Name	**Increase bedrock fracturing and opening of fractures / faults connecting the shallow weathered aquifer and deeper fractured bedrock aquifer.(If drill and blast method is used)**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					2.00
Final Significance					-15.00

Impact Name	Impacting production boreholes OHP7, OHP8 & OHP9, and spring OHP11.				
Alternative	Proposal				
Phase	Decommissioning				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	2	2	Reversibility of Impact	4	4
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-6.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.50
Final Significance					-9.75

Impact Name	Groundwater contamination				
Alternative	Proposal				
Phase	Decommissioning				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	4	4
Duration of Impact	4	3	Probability	2	3
Environmental Risk (Pre-mitigation)					-7.00
Environmental Risk (Post-mitigation)					-8.25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					2
Issue has received a meaningful and justifiable public response					
Cumulative Impacts					2

Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.	
Prioritisation Factor	1.50
Final Significance	-12.38

Impact Name	**Surface water contamination (as a secondary effect to groundwater contamination)**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	4	4	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.00
Environmental Risk (Post-mitigation)					-6.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-8.67

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

38. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- Ensure that as far as practicable, waste is collected, stored and disposed of by accredited vendors for recycling;

9.4.3.2. HYDROLOGICAL IMPACT ASSESSMENT

Impact Name	**Erosion**
Alternative	**Proposal**
Phase	**Decommissioning**
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	2	1	Reversibility of Impact	5	4
Duration of Impact	2	1	Probability	5	4
Environmental Risk (Pre-mitigation)					-13.75
Environmental Risk (Post-mitigation)					-7.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-8.17

Impact Name	**Surface water contamination**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	1	Reversibility of Impact	4	3
Duration of Impact	3	2	Probability	5	3
Environmental Risk (Pre-mitigation)					-15.00
Environmental Risk (Post-mitigation)					-5.25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.33
Final Significance					-7.00

Impact Name	Sediment runoff and increased suspended solids				
Alternative	Proposal				
Phase	Decommissioning				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	1	Reversibility of Impact	4	3
Duration of Impact	2	1	Probability	3	2
Environmental Risk (Pre-mitigation)					-8.25
Environmental Risk (Post-mitigation)					-3.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.50
Final Significance					-4.50

9.4.3.3. FLORA AND FAUNA

Impact Name	Re-establishment of regionally indigenous species in rehabilitated areas				
Alternative	Proposal				
Phase	Decommissioning				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	1	1	Magnitude of Impact	3	3
Extent of Impact	3	3	Reversibility of Impact	4	4
Duration of Impact	5	5	Probability	1	1
Environmental Risk (Pre-mitigation)					3.75
Environmental Risk (Post-mitigation)					3.75
Degree of confidence in impact prediction:					Low
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2

Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	4.38

Impact Name	**Control of alien invasive species**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	1	1	Magnitude of Impact	1	1
Extent of Impact	4	4	Reversibility of Impact	1	1
Duration of Impact	4	4	Probability	3	3
Environmental Risk (Pre-mitigation)					7.50
Environmental Risk (Post-mitigation)					7.50
Degree of confidence in impact prediction:					Low
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
Final Significance					7.50

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

39. **General** (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- The use of regional indigenous species will provide the necessary stimulant for the system to recover, emphasises should be placed on the relevant forbs as they are critical for pollinators
- A detailed rehabilitation plan of the areas to be decommissioned should be compiled by a team consisting of a registered professional vegetation scientist, reproductive biologist and pedologist.
- On completion of the decommissioning activities and relevant landscaping, the area should be monitored for at least a season or two for the establishment of alien invasive species. The alien invasive species should be controlled until the system has stabilised itself in conjunction with the regionally indigenous vegetation, as determined by the detailed rehabilitation plan compiled by a team consisting of a registered professional vegetation scientist, reproductive biologist and pedologist.

9.4.3.4. WETLAND

Impact Name	Erosion and desiccation of Watercourses				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	1	1	Reversibility of Impact	3	2
Duration of Impact	2	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-8.00
Environmental Risk (Post-mitigation)					-3.75
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.33
Final Significance					-5.00

Impact Name	Surface Water Contamination				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	3	1	Reversibility of Impact	4	3
Duration of Impact	2	2	Probability	4	2
Environmental Risk (Pre-mitigation)					-11.00
Environmental Risk (Post-mitigation)					-3.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					

Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-4.08

The recommended mitigation measures to assist in reducing the significance of this impact are as follows:

40. General (i.e. applicable to both the proposed project (Tunnel), and associated construction activities):

- Ensure that as far as practicable, all waste is collected, stored and disposed of by accredited vendors for recycling;
- Maintain a surface water monitoring procedure.

Impact Name	**Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)**				
Alternative	**Proposal**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	2	Reversibility of Impact	4	5
Duration of Impact	5	5	Probability	2	2
Environmental Risk (Pre-mitigation)					-7.50
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					3
Issue has received an intense meaningful and justifiable public response					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					2.00
Final Significance					-15.00

9.5. Discussion

Based on the findings of the impact assessment the majority of the potentially significant impacts can be managed and mitigated to a level of low or medium significance. Seven feasible stockpile areas alternatives have been assessed during the EIAR. **Table 30** below present comparison of post mitigation significance for each stockpile area assessed

TABLE 29: SUMMARISED IMPACT ASSESSMENT[6].

Impact	Phase	Environmental Risk		FS
		PRM	POM	
Noise Pollution	Construction	-9	-8	-8
Dust Nuisance	Construction	-9	-4.5	-5.25
Geological Instability	Construction	-15	-7.5	-15
Visual impact and impact on Sense of place	Construction	-7.50	-4	-4.67
Increased pressure on existing infrastructure	Construction	-5	-2	-2.33
Impacts on the safety and security of neighbouring/surrounding settlements	Construction	-7.50	-2	-2.33
Increase in the spread of diseases (including sexually transmitted diseases and HIV/AIDS)	Construction	-9.75	-4.50	-5.25
Traffic congestion and pavement damage	Construction	-4.50	-3	-3.50
Loss of land capability	Construction	-8.25	-6	-7
Potential market for Informal traders	Construction	3.50	5.25	5.25
Employment creation	Construction	2.75	9.75	11.38
Impact on tourism and eco-tourism	Construction	-4.25	-4.25	-4.96
Increase in stock theft	Construction	-8.25	-2	-2.33
Disruption to infrastructure and services	Construction	-5	-2	-2.33
Destruction of paleontology	Construction	-13.50	4	4.67
Destruction of graves (OT 02)	Construction	-20,00	-1,25	-2.08
Destruction of graves (OT01)	Construction	-20,00	-1,25	-2.08

[6] PRM= Pre mitigation environmental risk score; POM=Post mitigation environmental risk score; FS= Final significance score.

Impact	Phase	Environmental Risk		FS
		PRM	POM	
Destruction of graves (OT03)	Construction	-4	-1.25	-1.88
Destruction of graves (OT08 and 09)	Construction	-12.00	-1.25	-1.88
Destruction of farmstead (OT04-07)	Construction	-12.00	-1.25	-1.88
Destruction of species of concern	Construction	-21.25	12	14.00
Harvesting of medicinal plants or poaching of bush meat	Construction	-7.50	-3.50	-4.08
Off road driving beyond the development footprint	Construction	-6.75	-3	-3.50
Impact on indigenous natural vegetation	Construction	-18.75	7	8.17
Loss of Watercourse Habitat	Construction	-20	-16.25	-27.08
Erosion and desiccation of watercourses	Construction	-12.00	-4.50	-6
Groundwater contamination	Construction	-13	-6	-8
Surface water contamination (as a secondary effect to groundwater contamination)	Construction	-12	-6	-8
Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)	Construction	-7.50	-7.50	-15
Alien invasive species	Construction	-18.75	7.50	8.75
Sedimentation	Construction	-16.25	-3.5	-5.25
Pollution/ contamination of water resources	Construction	-16.25	9	12
Alteration of water resource dynamic	Construction	-20	-10.50	-19.25
Erosion	Construction	-16.25	-9	-13.50
Loss of vegetative cover	Construction	-12.50	-6.25	-6.25

Impact	Phase	Environmental Risk		FS
		PRM	POM	
Impacting production boreholes OHP7, OHP8 & OHP9, and spring OHP11.	Construction	-11.25	-6.50	-9.75
Groundwater contamination	Construction	-13.00	-6	-8
Surface water contamination (as a secondary effect to groundwater contamination)	Construction	-12.00	-6	-8
Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)	Construction	-7.50	-7.50	-15
impact of vibration	Construction	-7.50	-4.50	4.50
Waste management and disposal	Construction	-7.50	-2	-2.33
Impact on sense of place	Operation	-8.25	-6	-7
Noise pollution	Operation	-7.50	-7.50	-7.50
Impact on current land-use	Operation	-7.50	-4	-5.33
Pollution and alteration of water resource dynamic	Operation	-20	-9.75	-16.25
Increase bedrock fracturing and opening of fractures / faults connecting the shallow weathered aquifer and deeper fractured bedrock aquifer.(If drill and blast method is used)	Operation	-7.50	-7.50	-15
Impacting production boreholes OHP7, OHP8 & OHP9, and spring OHP11.	Operation	-11.25	-6.50	-9.75
Surface water contamination (as a secondary effect to groundwater contamination)	Operation	-7	-6	-8
Erosion and Desiccation of Watercourses	Operation	-12	-4.50	-6
Surface Water Contamination	Operation	-12	-3.50	-4.08

Impact	Phase	Environmental Risk		FS
		PRM	POM	
Encroachment of Alien Plants	Operation	-15	-8	-12
Surface water pollution/ contamination	Operation	-7.50	-4.50	-5.25
Erosion and Desiccation of Watercourses	Operation	-12	-4.50	-6
Surface Water Contamination	Operation	-12	-3.50	-4.08
Encroachment of Alien Plants	Operation	-15	-8	-12
Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)	Operation	-7.50	-7.50	-15
Surface water contamination	Operation	-7.50	4.50	-5.25
Sediment runoff and increased suspended solids	Operation	-8.75	-3.75	-5
Loss of land capability	Operation	-7.50	-4	-5.33
Erosion	Operation	-11.25	-6	-8
Control of alien invasive species	Operation	-18.75	7.50	8.75
Erosion and desiccation of Watercourses	Decommissioning	-8	-3.75	-5
Surface Water Contamination	Decommissioning	-11	-3.5	-4.08
Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)	Decommissioning	-7.50	-7.50	-15
Lowering and maintaining of lowered groundwater levels	Decommissioning	-7.50	-9.75	-16.25
Increase bedrock fracturing and opening of fractures / faults connecting the shallow weathered aquifer and deeper fractured bedrock aquifer.(If drill and blast method is used)	Decommissioning	-7.50	-7.50	-15

Impact	Phase	Environmental Risk		FS
		PRM	POM	
Impacting production boreholes OHP7, OHP8 & OHP9, and spring OHP11.	Decommissioning	-7.50	-6.50	-9.75
Groundwater contamination	Decommissioning	-7.00	-8.25	-12.38
Surface water contamination (as a secondary effect to groundwater contamination	Decommissioning	-7.00	-6.50	-8.67
Erosion	Decommissioning	-13.75	-7	-8.17
Surface water contamination	Decommissioning	-15	-5.25	7
Sediment runoff and increased suspended solids	Decommissioning	-8.25	-3	-4.50
Re-establishment of regionally indigenous species in rehabilitated areas	Decommissioning	3.75	3.75	4.38
Control of alien invasive species	Decommissioning	7.50	7.50	7.50
Erosion and desiccation of Watercourses	Decommissioning	-8	-3.75	5
Surface Water Contamination	Decommissioning	-11	-3.50	-4.08
Wetland Desiccation due to Increase Bedrock Fracturing and opening of Fractures/ Faults connecting the shallow Weathered Aquifer and deeper Fractured Bedrock Aquifer. (If Drill and Blast method is used)	Decommissioning	-7.50	-7.50	-15

10. COMPARATIVE ASSESSMENT OF ALTERNATIVES

The Scoping Report investigated many potential alternatives for the proposed project. Of these, the alternatives presented and discussed in Section 6 were anticipated to be feasible and have been assessed further in this EIAR. This section aims to provide:

- A summary of the feasible alternatives;
- A comparative assessment of the advantages and disadvantages of each feasible alternative; and
- Make a recommendation on the most suitable alternative.

10.1. Process Alternative

Process alternatives imply the investigation of alternative processes or technologies that can be used to achieve the same goal. This includes using environmentally friendly designs or materials, and reusing scarce resources like water and non-renewable energy sources.

Other process alternatives have been defined and implemented as incremental alternatives in this EIA and the EMPr. Specific process alternatives which were considered in this EIAR include the following:

10.1.1. TUNNEL OPTIONS

The following alternatives relating to the design capacity of the proposed project are considered:

- *Construction of a second double track tunnel adjacent to the existing single track tunnel*

The above alternative is currently the preferred alternative when compared to other alignments assessed by engineers. Elimination of other alignment options was due to longer distances that they cover, and as a result, substantial earthworks would be required during the implementation phase, which will result in high Capex value. The doubling of the tunnel was considered to be the most feasible option based on various considerations, including: operations, costing and environmental impact (e.g. increase in coal export, efficient use of the railway line with no congestion, etc.). The tunnel will have to cater for a double track. From an operations perspective this option will have the greatest advantage as it follows more or less the same alignment as the current line and will thus have the shortest runtime of all the options reviewed.

Based on the feasibility study undertaken by the appointed engineers, comparison of the total cost between various identified options reveals the new double line tunnel-option as the most economical option with reduced operational, social and environmental challenges. This option offers solutions to both the current situation and future capacity challenges. Construction of a double line tunnel is Transnet's preferred alternative due to the following reasons:

- A double line tunnel parallel to the existing single line tunnel is a viable option as it will address future needs. A double line tunnel will also address security issues in case of damage or collapse in one tunnel, operation can be shifted to the other tunnel while repairs are undertaken.

- From an operations perspective this option will have the greatest advantage as it follows more or less the same alignment as the current line and will thus have the shortest runtime of all the options reviewed.
- According to the feasibility study undertaken by Aurecon, this option is most economical with reduced operational, social and environmental challenges.
- Lower impact on wetlands.
- Minimal impact on farmland.
- Alleviate the danger of single line congestion.

10.1.2. WASTE HANDLING ALTERNATIVES

The construction of the proposed project will result in the generation and accumulation of significant quantities of waste rock and excavated materials. This section discusses available alternatives applicable to handling and management of waste rock and associated material. In the consideration of available options the accepted waste management hierarchy was followed (**Figure 49**).

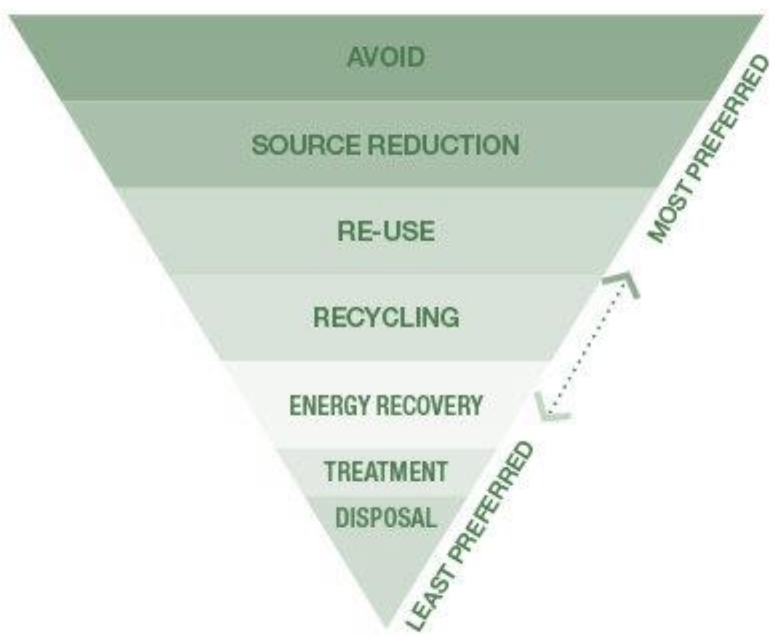

FIGURE 49: HIERARCHY OF WASTE MANAGEMENT

The options of avoidance, recycling and energy recovery have been excluded based on obvious factors, and the option of source reduction was considered by the engineering team in the design of the proposed project.

In respect of excavated material, a total of approximately 1 000 000m^3 of material will be generated through excavation of the tunnel and entrance / exit cuttings. According to the material investigation undertaken by the engineers (through an assessment of borehole cores taken out of the tunnel cross-section), it is anticipated that only a negligible amount of material will be suitable for reuse on this proposed project. The original geotechnical reports had previously concluded that the medium and coarse grained dolerites will be susceptible to rapid weathering, and that these lithologies must not be utilised for ballast or as an aggregate source. It is understood that the issue of usability of the tunnel spoil is receiving further attention and any available options for material reuse will be pursued through the collection of additional samples and tests to confirm whether the dolerites might selectively be usable as concrete aggregate- not only as a beneficial environmental consideration but a cost factor. Based on the nature of the proposed project, only rock materials that meet the SANS 1083 standards will be used during construction for the purpose of concrete mixing. However this material could possibly be reused on other projects in the future.

The waste rock is anticipated to consist primarily of inert lithologies and as such the treatment of this waste was not considered necessary. The excavation of the western portal high wall will however intersect a limited section of carboniferous rock which, if not managed correctly could result in the generation of acid leachate. This risk has been considered in the EIA and relevant management and mitigation measures suggested.

Material may have to be transported off-site to a public fill facility or to another site for reuse. It is important to note that due to the fact that opportunities for reuse of the excavated material by third parties are not presently defined, this EIA will assess the impacts, on the assumption that the material is stored/ disposed of permanently. Any future users of the material will need to comply with applicable legislation pertaining to the reuse of the material prior to use.

It is recommended that prior to disposal of any waste rock on new areas, that two existing borrow pits (stockpile area 17 and 18) situated approximately 3500m towards the east of the tunnel be filled and rehabilitated. This will allow for the responsible management and closure of these old borrow pits.

- *Stockpile all rock waste removed from the tunnel excavation, undertake rehabilitation and blend with the surrounding environment.*

When compared to all other options considered during scoping phase, disposal and rehabilitation of stockpiled rock material is considered the most feasible option for the proposed project. Considering the volume of waste rock material to be generated by the tunnel construction and the fact that there are no local third party users for this material, the only remaining option is to store/ dispose of the waste rock in a responsible manner for the foreseeable future.

This option will allow rock waste to remain protected after construction until a need arises (if a need arises) to re-use the material. This option is considered feasible due to the following reasons:

- Rehabilitation, if undertaken properly, can be a good solution to deal with a large amount of waste rock anticipated from tunnel excavation;
- Waste rock stockpiles can be landscaped with the surrounding environment through reinstatement of suitable indigenous vegetation;

- Rehabilitated stockpiles can be reused at a later stage when need arise (e.g. building of roads or rehabilitation of new borrow pits);
- If rehabilitated correctly, the areas can be utilised for other land-uses acceptable to this area (i.e. grazing); and
- Rehabilitation of waste rock stockpiles will contribute to the reduction of dust and water pollution to surface and groundwater resources.

10.2. LOCATION ALTERNATIVES

Location alternatives relate to the main proposed project components (e.g. tunnel route) as well as the location of ancillary activities and structures (e.g. stockpile areas, construction camps, laydown areas, staff accommodation, etc.).

10.2.1. LOCATION OF STOCKPILES

As noted in Section 6.2.2, a high level sensitivity analyses was undertaken to identify suitable options for the location of the preferred stockpile area, following the assessment that the original stockpile option was considered environmentally sensitive. During the preliminary investigations the Original area was selected for stockpiling of rock materials that will be generated during excavation of the tunnel. From the engineering perspective the Original area was considered the best suitable area due to the hauling distance from the tunnel, size, topography and hydrology. Specialists (Ecological; Hydrological and Hydrogeological; Wetland; Heritage; and Noise and Vibration Assessment) investigations were then undertaken and sensitivity maps were then created for each specialist study undertaken. Based on the specialist investigations undertaken and from the environmental point of view the Original Area was not considered feasible due to its sensitivity.

The outcome of the specialist studies led to the identification of further 21 potential sites (site area 1 to 21, (see **Figure 39: proposed project Feasible stockpile area**)) by the EAP. Desktop assessment and screening of the 21 potential areas was then undertaken by the engineers in order to screen those areas that are not feasible. Majority of the areas where excluded due to their insufficient size, affecting new landowners; topography and distance from the respective tunnel portals. From the screening exercise that was undertaken only 6 feasible areas (area 1, 2, 5, 11, 20, 21 -**Figure 39**) together with the Original area where identified for further assessment. Field verification was then undertaken by each specialist.

Seven feasible stockpile areas alternatives have been assessed during the EIAR. **Table 30**, presents the comparison of post mitigation significance for each stockpile area assessed.

TABLE 30: COMPARISON OF STOCKPILE AREAS POST MITIGATION SIGNIFICANT

Specialist	Impact	Phase	Activity	Stockpile Location Assessment						
				Original Area	Stockpile Area 1	Stockpile Area 2	Stockpile Area 5	Stockpile Area 11	Stockpile Area 20	Stockpile Area 21
EIIMS	Nuisance from dust and noise	Construction	Stockpile	-9.00	-4.00	-4.50	-4.50	-4.00	-6.75	-6.75
	Visual intrusion	Construction		-8.25	-6.00	-4.00	-6.00	-3.50	-4.00	-4.00
	Impacts on land capability			-8.25	-6.00	-3.50	-6.00	-3.00	-4.00	-4.00
	Potential effect on tourism and eco-tourism	Construction		-7.50	-4.00	-3.50	-4.00	-3.00	-4.00	-4.00
	Impact on sense of place	Operation		-9.00	-6.00	-4.00	-6.00	-3.50	-4.00	-4.00
Ecological t Assessment	Harvesting of medicinal plants or poaching of bush meat	Construction	Stockpile	-3.5	-4.25	-3.5	-4	-3.75	-3.5	-4.25
	Off road driving beyond the development footprint	Construction		-3	-3.5	-3	-3.25	-3.25	-3	-3.5

Specialist	Impact	Phase	Activity	Stockpile Location Assessment						
				Original Area	Stockpile Area 1	Stockpile Area 2	Stockpile Area 5	Stockpile Area 11	Stockpile Area 20	Stockpile Area 21
	Control of alien invasive species	Construction		7.5	6.75	7.5	7.25	7.25	7.5	6.75
	Control of alien invasive species	Operation		7.5	6.75	5	7.25	7.25	7.5	7.25
Heritage Assessment	Destruction of graves (OT01; OT03; OT08 and 09)	Construction	Stockpile	-1.25	-1.25	-1.25	-	-	-	-
	Destruction of farmstead (OT04-07)	Construction		-	-	-1.25	-	-	-	-
Surface water Assessment	Loss of wetland habitat	Construction	Stockpile	-21.25	-18.75	-17.50	-18.75	-17.50	-18.75	-18.75
	Seepage from waste rock material	Construction		-15.00	-15.00	-13.00	-15.00	-13.00	-15.00	-15.00
Geohydrological Assessment	Groundwater contamination	Construction	Stockpile	-4	-3.5	-3.5	-4	-3.5	-4	-4

Specialist	Impact	Phase	Activity	Stockpile Location Assessment						
				Original Area	Stockpile Area 1	Stockpile Area 2	Stockpile Area 5	Stockpile Area 11	Stockpile Area 20	Stockpile Area 21
	by means of leachates									
	Spring water contamination by means of leachates	Construction		-4	-4	-4	-4	-4	-4.5	-4.5
	Groundwater contamination by means of hydrocarbon spills	Construction		-8	-6	-6	-8	-6	-8	-8
	Surface water contamination (as a secondary effect on groundwater or spring water contamination)	Construction		-6	-5	-5	-6	-5	-5.5	-5.5
	Groundwater contamination	Operation		-9.75	-6	-6	-9.75	-6	-9.75	-9.75

Specialist	Impact	Phase	Activity	Stockpile Location Assessment						
				Original Area	Stockpile Area 1	Stockpile Area 2	Stockpile Area 5	Stockpile Area 11	Stockpile Area 20	Stockpile Area 21
	by means of leachates									
	Spring water contamination by means of leachates	Operation		-9.75	-6.5	-6.5	-9.75	-6.5	-11.25	-11.25
	Groundwater contamination by m11eans of hydrocarbon spills	Operation		-3	-3	-3	-3	-3	-3	-3
	Surface water contamination (as a secondary effect on groundwater or spring water contamination)	Operation		-11.25	-6	-6	-11.25	-6	-12	-12
Wetland Assessment	Loss of Wetland Habitat	Operation	Stockpile	-21.25	-18.75	-17.5	-18.75	-17.5	-18.75	-18.75

Specialist	Impact	Phase	Activity	Stockpile Location Assessment						
				Original Area	Stockpile Area 1	Stockpile Area 2	Stockpile Area 5	Stockpile Area 11	Stockpile Area 20	Stockpile Area 21
	Seepage from waste rock material	Operation		-15	-15	-13	-15	-13	-15	-15
	Creation of new access roads	Operation		-17.5	-12	-12	-11	-12	-13	-12
TOTAL Sensitivity and preference ranking				**-180.5 (7)**	**-141 (3)**	**-129 (2)**	**-153.5 (5)**	**-122.5 (1)**	**-152.75 (4)**	**-154 (6)**

With regard to the location of the proposed project stockpile areas and based on the environmental impact assessment undertaken by EAP and various specialists for all (seven) preferred stockpile areas, it can be concluded that **stockpile area 11 and stockpile area 2** are considered more preferable than all other areas due to their lower significance scoring/ rating of **-129.00 and -122.50** respectively. In conclusion the following order of priority should be applied to the location of stockpiled waste rock:

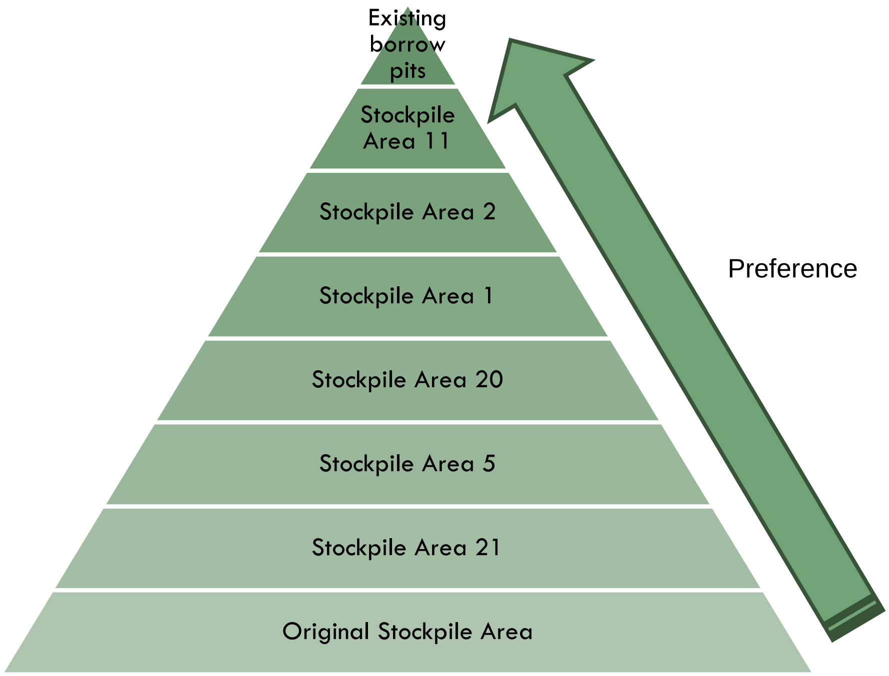

FIGURE 50: STOCKPILE AREA ORDER OF PREFERENCE

An important consideration is that whilst Stockpile area 2 is identified as one of the 2 preferred areas, there remain certain environmental sensitivities which need to be managed and mitigated. One of the key aspects is the fact that Area 2 encompasses certain identified heritage features (refer to Section 5.4.5.2, and **Figure 51**). As per the recommendations of the heritage specialist these areas must be excluded from the site to be utilised for stockpiling.

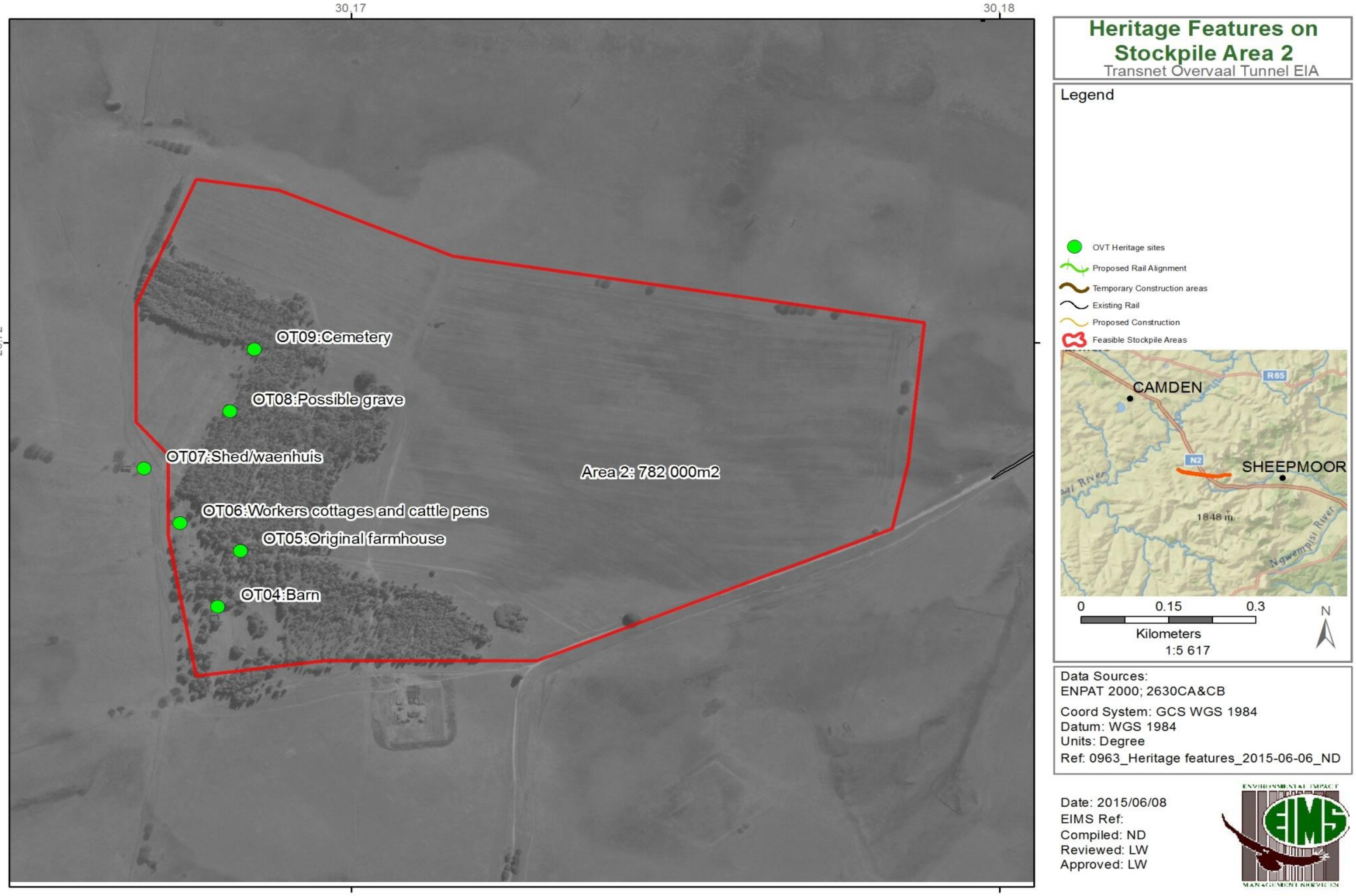

FIGURE 51: HERITAGE FEATURES ASSOCIATED WITH STOCKPILE AREA 2.

Considering that the combined areas of stockpile area 11 and 2 combined with the existing old borrow pits, are likely to meet the volume requirements to dispose of the anticipated ~1 000 000m3 of waste rock, the following specific management and mitigation measures should apply to these sites:

- Exclusion of the identified heritage features and associated buffer should Stockpile area 2 be used;
- The land acquisition and negotiation process must commence with the relevant landowners in order to discuss agreements and compensation;
- Waste rock stockpiles should be located away from delineated wetlands and their 50m buffer as far as possible. Where this is not possible due to the extensive occurrence of wetlands; wetland areas with a Marginal/low Ecological Importance and Sensitivity, and Seriously to Critically modified Present Ecological State should first be targeted.
- Waste rock stockpile must be properly lined to reduce the risk of any leachate entering watercourses, specifically surrounding wetlands.
- Existing access roads should be used as far as possible rather than creating new access roads. In cases where new access roads are needed, these should not be constructed within wetlands and other watercourses, particularly wetlands with a high Ecological Importance and Sensitivity, and Pristine to Largely natural Present Ecological State.
- The use of standard erosion control measures, such as interception drains, contour planting, silt fences, establishment of groundcover species, optimal drainage construction, and silt ponds are applied where appropriate. Where possible earthwork activities should be undertaken during dry periods;
- Traffic and movement (haul roads) over stabilised areas will be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the Environmental Manager;
- The total footprint area to be developed will be kept to a minimum by demarcating the construction areas and restricting construction to these areas only;
- The identified homestead, should be demarcated as a no-go area and include a 50 meter buffer around the sites as a whole;
- In the event that that a redesign and safety buffer is not possible and extensive documentation of the farmstead and structures that include, site layout sketches, excavations and detailed photographic recording will be required;
- A homestead destruction permit can then be lodged with the Mpumalanga Provincial Heritage Authority;
- DWS suggests that all waste stockpile area/s or facilities be constructed on aquifers which are classified as “Poor Aquifers” as well as on areas which have a minimum groundwater level depth of 2m or more. The aquifers underlying the project area are classified as a “Minor Aquifer” and DWS may therefore require further site specific hydrogeological investigations once the final material stockpile area/s have been selected and a motivational letter on why the material stockpile area has to be constructed on this specific aquifer during the permitting stages;

- Minimum of two groundwater monitoring boreholes must be drilled around a proposed material stockpile area;
- Groundwater quality monitoring must be done on the four of the groundwater abstraction boreholes (OHP7, OHP8, OHP9 and OHP12), the four natural springs (OHP5, OHP10, OHP11, OHP18) and for the two proposed material stockpile monitoring boreholes. Monitoring should be done on a quarterly based for the first year, thereafter only annually for the next 3 years of operations;
- Groundwater quality monitoring must be done on all four the groundwater abstraction boreholes (OHP7, OHP8, OHP9 and OHP12), four natural springs (OHP5, OHP10, OHP11, OHP18), from the material stockpile areas monitoring boreholes, before starting decommissioning and a year after decommissioning;
- Alien infested topsoil stockpiles should be monitored and any alien invasive species eradicated once they have been identified.

10.2.2. CONSTRUCTION ACCOMODATION ALTERNATIVES

It is anticipated that the social impacts associated with the creation of a localised construction camp/ accommodation facility close to the proposed project site would not be preferable. This option would result in the establishment of accommodation facilities in isolation to existing social structures and services. Construction workers should be housed off site in one of the nearby settlements where infrastructures already exist (e.g. Ermelo or Sheepmoor). Two possibilities are anticipated to exist for the housing of the construction workers, viz. Sheepmoore and Ermelo. Sheepmoore is situated closer to the proposed site and is less densely populated than Ermelo town. With reference to **Table 31**, it is suggested that workers be housed in Sheepmoore or another established township, as opposed to providing on-site accommodation:

TABLE 31: COMPARISON OF ACCOMODATION OPTIONS.

ON SITE ACCOMMODATION (i.e. within the immediate area around the proposed project)	
Advantages	**Disadvantages**
• Limited travelling to, and from, site on a daily basis; and • Attraction of informal traders (positive impact to traders).	• Lack of water supply, sewage and other required bulk services; • Impact on Greenfield sites for placement of new camps; • Safety and security impact to the surrounding farmers and their livestock; • Attraction of informal traders (negative impact to surrounding); • Localised social disruption; and

	Significant pressure to the existing farmer's boreholes.
NEIGHBOURING FORMAL TOWN/ SETTLEMENT	
Advantages	**Disadvantages**
Existing services infrastructure (e.g. water, electricity and sewer); No impacts on Greenfield site since infrastructure already in place; Increase of income to existing local businesses and small shops, and short term stimulation of local economy; and Access to existing social, security services (e.g. policing).	Travelling to and from site will be required on a daily basis which might have impact on traffic (distance depend on the town or township that will be chosen); and Localised social disruption.

10.2.3. OTHER LOCATION ALTERNATIVES

With reference to D, the proposed project footprint (including temporary and permanent features) was overlaid onto the local environmental sensitivities. This allowed for the optimisation of the location of these features to minimise, where practically possible, the impact on the environment. In this regard the following should be specifically noted:

- The proposed footprint indicates that the temporary construction areas located at the western portal are located within a defined high sensitivity area (from and ecological perspective). In an effort to address this the proposed temporary construction area has been aligned to the disturbed areas alongside the existing Transnet service road- As far as reasonably possible this area should try and limit the width of the area and consequent extension into the adjacent natural vegetation.
- The proposed footprint indicates that the planned temporary construction camp at the eastern portal, will most likely directly impact on an identified heritage feature- namely OT02 (refer to Section 5.4.5.2 and **Figure 52**). In accordance with the recommendations of the heritage specialist it is recommended that the temporary construction area be redesign/ relocated to exclude this cemetery from the foot print.
- With reference to **Figure 52**, another heritage feature is located within the original stockpile area. Considering the high consolidated environmental sensitivity of this original stockpile area, it is recommended that this stockpile area be excluded from the development footprint (refer to Section 10.2.1).

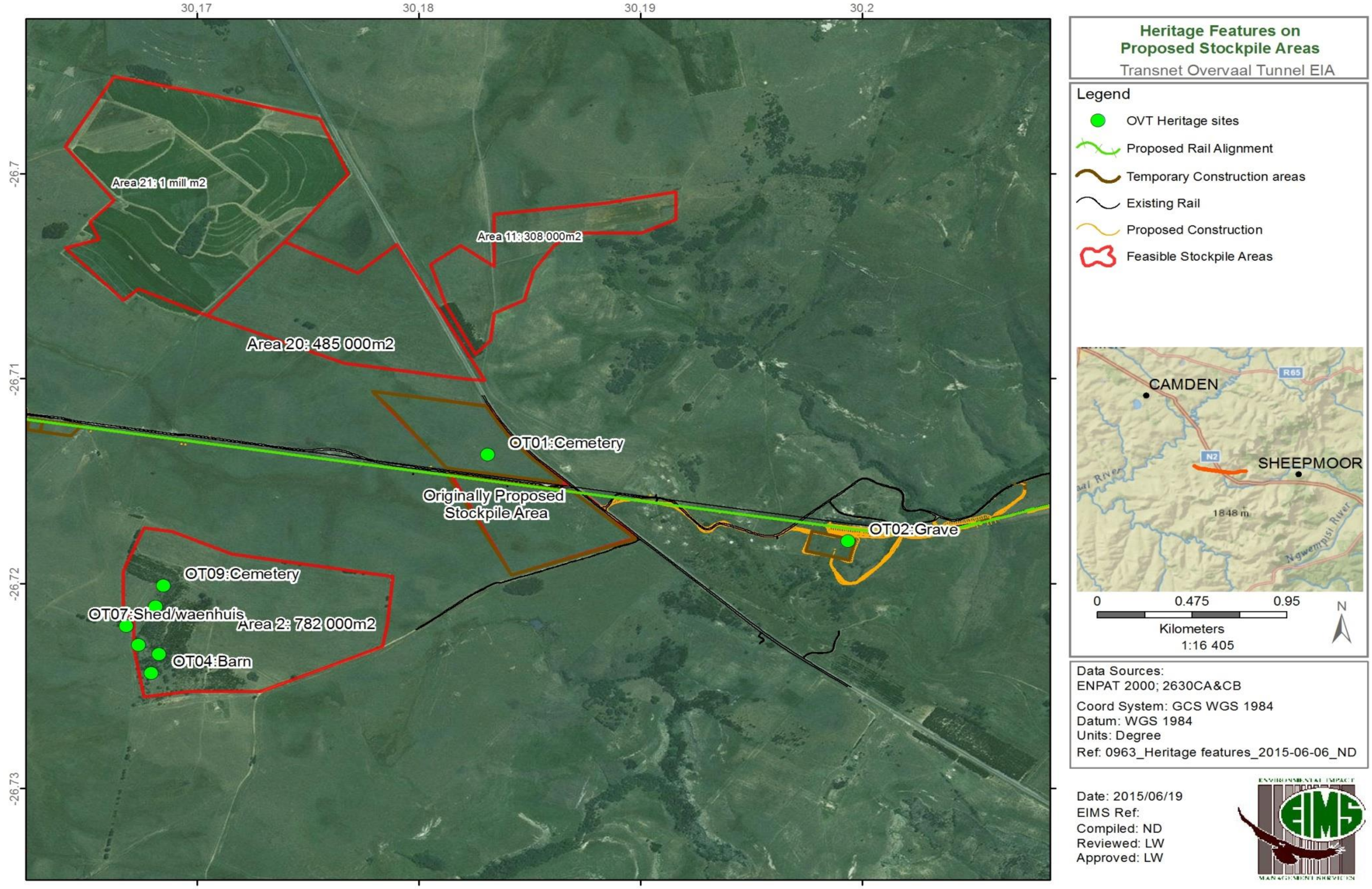

FIGURE 52: HERITAGE FEATURE IN RELATION TO PROPOSED CONSTRUCTION CAMP.

10.3. TECHNOLOGICAL ALTERNATIVE

Selection of the techniques to be adopted for construction of a tunnel section shall take into account the nature of the substrata and the levels of the tunnel involved. Technological alternatives for this development will involve drilling and blasting or the use of a TBM. Each of these is discussed in the relevant sections below. It has been concluded that considering the advantages and disadvantages associated with each of these options, that the Drill and Blast alternative is utilised for this proposed project.

10.3.1. DRILL AND BLAST

Drill and blast excavation is generally suited to hard rock conditions with substantial rock cover. It is commonly used in mines, quarries and tunnels as it is an efficient, flexible and cost effective method of removing high strength rock. However, vibrations induced by blasting can cause disturbance to the surrounding ground and potentially damage nearby structures. Therefore constant monitoring and physical protection measures must be put in place to ensure that the effects of blasting are controlled. Nearby structures with low vibration limits can severely restrict the rate of excavation progress. Once blasting is carried out, waste rock and soils are transported out of the tunnel before blasting continues. The Drill and Blast option is therefore suited to the conditions and requirements of the proposed project (Tunnel construction). Based on the evaluation undertaken by the Engineers and comparison of advantages and disadvantages of both options (please refer to Table 32 and Table 33), **Drill and Blast construction method** is recommended as the most preferred method to use during the excavation of the proposed tunnel.

FIGURE 53: DRILL AND BLAST TUNNELING

TABLE 32: ADVANTAGES AND DISADVANTAGES OF DRILL AND BLAST

Advantages	Disadvantages
• Blasting would significantly reduce the duration of vibration, though the vibration level (intensity) may be higher when compared with TBM tunnelling (with proper blast design & techniques vibration can be reduced); • More labour intensive than TBM;	• Potential hazard associated with establishment of a temporary magazine site for overnight storage of explosives. • Adequate structural support measures are required when adopting this method for tunnelling; • Possible damage to existing tunnel resulting in delay in operations;

• Drill and blast is typically more cost effective and flexible (i.e. less dependent on rock conditions); • Can be undertaken at more than one site simultaneously (from both ends of the tunnel); • Much of the drilling and excavating work will be done inside the tunnel, which will reduce noise levels to the surrounding areas; • Less electrical demand; • More flexible; • Shorter lead time; • Smaller access cutting; • Optimum cross section; • Uses significantly less construction water; and • Significant saving on the overall CAPEX of the project.	• Once blasting is carried out, waste rock and soil is transported out of the tunnel before further blasting which is time consuming when compared to TBM; (http://miningandblasting.wordpress.com); • If drill and blast method is used Wetland desiccation can therefore occur due to increase bedrock fracturing and opening of fractures/ faults connecting the shallow weathered aquifer with the deeper fractured bedrock aquifer; and • Blasthole drilling can cause excessive noise emissions, particularly when carried out at or near ground level and close to the site boundary.

10.3.2. TUNNEL BORING MACHINE

Tunnel boring by way of a TBM is often used for excavating long tunnels. An effective TBM method requires the selection of appropriate equipment for different rock mass and geological conditions. The TBM may be suitable for excavating tunnels which contain competent rocks that can provide adequate geological stability for boring a long section tunnel without structural support.

FIGURE 54: TUNNEL BORING MACHINE

The most notable difference is the fact that the drill and blast method uses significantly less construction water than the TBM method. An overall saving in the construction duration of the TBM construction method of approximately six months seems possible; however there are serious program-related risks that may cause substantial delays on the TBM option. According to the engineers there is also more opportunity in reducing the construction duration of the drill and blast option during contract negotiations. The drill and blast construction method has a significant saving on the overall CAPEX of the proposed project, i.e. approximately R1bn (20%), compared to the TBM construction method. Based on the evaluation, the advantages of the TBM construction method have proven not to outweigh its cost-premium. Based on the evaluation undertaken by the Engineers, TBM will not be taken forward since it is not considered feasible for the proposed project (Tunnel construction).

TABLE 33: ADVANTAGES AND DISADVANTAGES OF TUNNEL BORING MACHINE

Advantages	Disadvantages
• Potential environmental impacts (noise, dust and visual) on sensitive receptors are anticipated to be reduced when compared to conventional drill and blast methods. The impacts are typically restricted to those located near the launching and retrieval shafts; • TBMs have the advantage of limiting the disturbance to the	• Extremely hard rock can cause significant wear of the TBM rock cutter and may slow down the progress of the tunnelling works to the point where TBM becomes inefficient and uneconomical and may take a longer time than the drill-and-blast tunnelling method; • The major disadvantage is the upfront cost. TBMs are expensive to construct, and can be difficult to transport. However, as a tunnel becomes longer, the cost of tunnel boring machines versus drill and blast is actually less this is because tunnelling with TBMs is much more efficient and results in a shorter overall project timeframe;

surrounding ground and producing a smooth tunnel wall. This significantly reduces the cost of lining the tunnel; • TBM's are typically safer than alternative excavation options; • The TBM is typically less labour intensive; • TBM's typically result in less ground vibration; • Less ground movement; • Faster production rate; and • According to the Ecological specialist TBM method is expected to have a lower risk of lowering the groundwater level in the weathered shallow aquifer, which is most likely an important hydrological driver for water discharge into springs and surrounding wetlands located above the tunnel	• Vibration impacts can be a concern particularly to humans and animals residing within and around the proposed project site due to the constant vibration frequencies (reverberation); • TBM's are very dependent on suitable rock conditions; • Requires separate electricity supply; • Uses more water during construction; • Breakdowns can cause substantial delays on the construction program; • Will require the construction of a haul road on the Maviristad side; • Can only be undertaken at one site; • Requires a bigger footprint to start; • Breakdowns can cause substantial delays on the construction program; • According to the Vibration specialist, Tunnel Boring Machine method is preferred because if used, there will be no significant vibration sources during construction. Vibration impact of using a TBM is less than using the blasting method. • manufacturing delays and delays in the delivery logistics chain; and • Higher proposed project CAPEX;

11. ENVIRONMENTAL IMPACT STATEMENT

The key findings of this Environmental Impact Assessment Report are:

- With reference to the approved Plan of Study for Scoping the following alternatives were identified and have been investigated, and comparatively assessed:
    - Process alternative: Waste handling options.
    - Location alternative: Localised site alternatives and optimisation (proposed project and associated construction activities), including:
        - Optimal location for the proposed waste rock stockpile;
        - Location of construction accommodation facilities; and

        - Optimal location for temporary and permanent construction camps.
    - Technological alternatives: Use of tunnel boring machine; and Drill and Blast excavation.
- The receiving environment has the following key environmental sensitivities that were considered in this EIAR:
    - The study area transects the vulnerable Eastern Highveld Grassland and the least concern Wakkerstroom Montane Grassland and it is considered potential location of sensitive flora (includes vegetation units classified as Endangered and Less Threatened);
    - The presences of ten provincially protected species had been confirmed, as well as the habitat suitability of at least one threatened Red Data plant, *Gladiolus malvinus*. The study area includes the usual variations of faunal habitat found throughout most of the Mesic Highveld Grassland Bioregion (pers. obs.). Disturbed primary vegetation, secondary vegetation and transformed areas are commonly found commonly in the southern parts of Mpumalanga.
    - A total of 18 sensitive receptors were identified within 2km radius around the proposed tunnel area, only eight sensitive receptors are at medium risk to be impacted upon by the proposed tunnel project. These eight (8) receptors consist out of four production boreholes (OHP7, OHP8, OHP9 and OHP12) and four (4) natural springs (OHP5, OHP10, OHP11, OHP18). Based on the investigation most groundwater users abstract from the weather aquifers with the exception of a primary school production borehole OHP13 which is drilled into the deeper fractured bedrock aquifer. Most of the groundwater qualities have a neutral pH and have low Electrical Conductivity (EC) and Total Dissolved Solids (TDS) concentrations, except for OHP6 which is slightly acidic (pH value 5.84). Mostly all the metal parameters falls within the SANS 241-1: 2011 Water Quality Standards, except for the OHP10, OHP14 and OHP17, which manganese concentration (0.443mg/l and 0.095mg/l), and iron concentrations (4.54mg/l, 0.569mg/l and 0.609mg/l) exceeded the SANS Water Quality Standards (refer to the attached Hydrogeological specialist report).
    - Numerous wetlands, which constitute a sensitive habitat, are found within proposed project study area and the surrounding (refer to the attached wetland impact assessment report);
    - The Present Ecological State (PES) of delineated watercourses assessed in the Usutu to Mhlatuze WMA range from Largely natural (Class B PES) to Largely modified/ Seriously modified (Class D/E PES). The majority of the watercourses have a Moderately modified (Class C) PES or worse (only a single watercourse with a Class B PES is present). The Ecological Importance and Sensitivity (EIS) values range from Moderate/ Low to High.

- The Present Ecological State (PES) of delineated wetlands assessed in the Upper Vaal WMA range from Pristine/ Largely natural (Class A/B PES) to Seriously modified/ Critically modified (Class E/F PES). The seep and unchannelled valley bottom wetlands located above the proposed new Overvaal Tunnel are is the best overall condition, with PES values that range from A/B to B/C. The Ecological Importance and Sensitivity (EIS) of the same three wetlands have a Very high value, while remaining wetlands range between Very high to Moderate.
- According to the Surface water specialist, there is a potential for impacts to water quality of water resources during the project as a result of the following key impacting processes:
    - An increase in suspended sediments due to removal of vegetation and the disturbance catchment areas;
    - The release of toxicants (oils, greases and other chemicals) by machinery or the failure to adhere to EMP measures. Coal will be transported by the rail passing through the proposed new tunnel and may be classified as a hazardous material if it were to contaminate surrounding soil and water.
- The proposed project falls within rocky ridge and wetland areas that are deemed to be of high sensitivity as they provide potential habitat and migratory connectivity for faunal species as well as the potential to host a higher diversity of floral species;
- According to the ecological importance classification for the two quaternary catchments (C11B and W53A) in the area, the systems can be classified as sensitive to moderately sensitive in terms of ecological importance and sensitivity;
- The assessment shows that construction noise at all Noise Sensitive Areas has an Environmental Significance Rating of “Low” i.e. *where this impact would not have a direct influence on the decision to develop in the area*;
- The assessment shows that construction vibration (both blasting and tunnel boring) has an Environmental Significance Rating of “Low” i.e. *where this impact would not have a direct influence on the decision to develop in the area*;
- A number of heritage features exist within the proposed project study area; and
- The groundwater resources are of drinking water standard.

- Impacts were identified during scoping and those impacts which were likely to have a significant impact were assessed for significance in this EIAR.

- Majority of the identified and assessed impacts have low to medium significance provided that the suggested mitigation measures are implemented during all phases of the proposed development. Of the impacts assessed the following impacts were identified as having a MEDIUM significance, post mitigation (please refer to **Table 29**).
  - Employment creation;
  - Destruction of species of concern;
  - Loss of Watercourse Habitat;
  - Pollution/ contamination of water resources;
  - Alteration of water resource dynamic;
  - Erosion;
  - Pollution and alteration of water resource dynamic; and
  - Lowering and maintaining of lowered groundwater levels.
- None of the identified and assessed impacts have HIGH significance after implementation of suggested mitigation measures; however *loss of watercourse habitat* and *alteration of water resource dynamic* impacts where recorded as high following consideration of the "prioritisation factor".
- Various alternatives were identified and the feasible alternatives comparatively assessed, with the following alternatives being recommended for authorisation:
  - Construction of the new double tunnel approximately 20m south of, the existing Overvaal single tunnel- as per the footprint indicated in Appendix CD;
  - Relocation of temporary construction camp for eastern portal to avoid an identified heritage feature;
  - Stockpile area 11 and 2 considered more preferable than the others assessed;
  - The location of construction phase workers accommodation within the nearby towns (Sheepmoore; Ermelo; etc); and
  - Use of Drill and Blast option for tunnelling.
- The management and mitigation measures as listed in Section 9.4, have been incorporated into the EMPr, and in turn should be made binding through the EA.

12. ASSUMPTIONS AND LIMITATIONS

This section provides a list of assumptions, and limitations applicable to this Environmental Impact Assessment Report:

- It is assumed that all information provided by the applicant and the technical team which informed the environmental consultants as well as which is contained within this report is reliable, accurate and up-to-date.
- All specialists who undertook specialist studies are qualified and have the necessary experience to undertake the necessary investigations required. Please refer to the individual specialist reports attached to review the specific assumptions and limitations applicable to the individual specialists.
- All information and reports obtained from the specialists have taken into consideration all relevant information pertaining to their specialisation.
- The sensitivity maps prepared and the source data were supplied in various formats and required spatial adjustment for the mapping purposes. The inaccuracy of these maps is not expected to detract from the primary purpose of broad delineation of sensitive areas.
- The Impact Assessment was informed by and prepared based on: expert specialist knowledge (for aspects which included specialist sub-consultants); professional opinion; and literature research. The rating process is largely a qualitative assessment undertaken by the EIA team. The calculations in the significance rating are based on a logical equation for this qualitative assessment and are not based on quantitative data.
- The information contained in this report was sourced from information and data supplied by third parties that is assumed to be complete, valid and true.
- This report is based on information available at the time. The information, data, observations and evidence on what this report is based is beyond the control of EIMS and may change without notice.
- Where reference is made to legislation or other statutory provisions in this report the original legislation or other statutory provisions will always take precedence and the reader is directed to revert to the original legislation or statutes.

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