

Draft Basic Assessment Report

Transnet Sishen Railway Line Link in Gamagara Local
Municipality, Northern Cape Province

Transnet

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Abbreviations and Acronyms

ADU	Animal Demography Unit
BA	Basic Assessment
BAR	Basic Assessment Report
CBA	Critical Biodiversity Areas
CLO	Community Liaison Officer
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs And Tourism (now the DEA)
DMR	Department of Mineral Resources
DoE	Department of Energy
DWAF	Department of Water Affairs and Forestry (now DWS)
DWS	Department of Water And Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EN	Endangered
EO	Environmental Officer
ESA	Ecological Support Area
GA	General Authorisation
GN	Government Notice
GNR	General Notice Regulation
HGM	hydrogeomorphic
HIA	Heritage Impact Assessment
HIV	Huma Immunodeficiency Virus
I&AP	Interested and Affected Party
IAIA	International Association for Impact Assessment
IDP	Integrated Development Plan
IUCN	International Union for Conservation of Nature
LT	Least Threatened
km	kilometre
m	metre
m ²	square metres
MAP	Mean Annual Precipitation
MEC	Member of the Executive Council
MTPA	mega tonnes per annum
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004), as amended

NEM:PA	National Environmental Management: Protected Areas Act (No. 57 of 2003)
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008), as amended
NEMA	National Environmental Management Act (No. 107 of 1998), as amended
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (No. 25 of 1999)
NWA	National Water Act (No. 36 of 1998) as amended
NWCS	National Wetland Classification Systems
ONA	Other Natural Area
PES	Present Ecological State
PPP	Public Participation Process
S&EIR	Scoping And Environmental Impact Reporting
SABAP	South African Bird Atlas Project
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SCC	Species of Conservation Concern
SG	Surveyor General
STATS SA	Statistics South Africa
UNEP	United Nations Environment Programme
WMA	Water Management Agency
WULA	Water Use Licence Application

1. Introduction

Background

AECOM SA (Pty) Ltd was appointed by Transnet SOC Limited (Transnet), the Applicant, to undertake a Basic Assessment Process for the proposed expansion of railway infrastructure through a rail link measuring approximately 2.1 km to be constructed between two existing rail lines in Sishen in the Northern Cape to address bottlenecks of trains on the line.

The development triggers activities listed in the National Environmental Management Act 107 of 1998 necessitating a basic assessment as specified in terms of Government Notice Regulations (GNR) 983 (Listing Notice 1) of the Environmental Impact Assessment (EIA) Regulations (2014) as amended.

Purpose of the Study

The Basic Assessment (BA) process is a planning and decision-making tool. It identifies potential positive and negative impacts that a proposed project may have on the receiving environment (including the biophysical, social and economic environments), and recommends ways to avoid or minimise the negative impacts and enhance the positive ones.

The purpose of the BA process is to assist both the environmental authority (Department of Environmental Affairs, DEA) and the Applicant (Transnet) in making decisions regarding the implementation of the proposed project.

AECOM is conducting the BA process in terms of Government Notice Regulations (GNR) 983 (Listing Notice 1) of the Environmental Impact Assessment (EIA) Regulations (2014) as amended. No activities contained in GNR 984 (Listing Notice 2) or GNR 985 (Listing Notice 3) are applicable to the proposed project. As such, only a BA process, and not a Scoping and Environmental Impact Reporting (S&EIR) process, is required. The EIA Regulations (2014) as amended were promulgated in terms of the National Environmental Management Act (No. 107 of 1998), as amended (NEMA).

Due consideration is also given to the National Water Act (No.36 of 1998) (NWA), the National Heritage Resources Act (No.25 of 1999), related guideline documents, and other applicable legislation.

The Draft Basic Assessment Report will be used as supporting documentation for the separate Water Use License Application which will be submitted to the Department of Water and Sanitation.

The findings identified and assessed by the Environmental Assessment Practitioner (EAP) and specialists in this report ensure that appropriate mitigation measures are recommended to achieve sustainable development.

Structure of the Report

This structure of this report is outlined in Table 1, and complies with Section 19 and Appendix 1 of the EIA Regulations (2014) as amended.

Table 1: Structure of the report

Chapter No	Chapter Heading
Chapter 1	Introduction: This chapter provides a background to the project and the purpose for this report.
Chapter 2	Project Team: Provides details of the Applicant and the EAP's project team.
Chapter 3	Project Overview: Provides a description of the proposed project, motivation for the proposed project as well the limitations associated with this assessment.
Chapter 4	Description of Alternatives: This chapter presents considerations for different possible means of meeting the general purpose and need of the proposed activity.
Chapter 5	Legislation and Guideline Documents: This chapter provides the applicable legislative requirements related to the proposed project.

Chapter No	Chapter Heading
Chapter 6	Study Approach and Methodology: Provides a summary of the approach and methodology used during the impact assessment process, the compilation of the EMPr and public consultation process.
Chapter 7	Description of the Affected Environment: This chapter describes the receiving environment that could possibly be affected by aspects of the proposed project.
Chapter 8	Environmental Impact Assessment: Provides a detailed description of the potential impacts associated with the proposed project.
Chapter 9	Environmental Impact Statement: This chapter summarises the impact of the proposed project on the environment.
Chapter 10	Recommendations: This chapter propose specific solutions to potential challenges identified.
Chapter 11	Conclusion: Deductions based on the findings of the study.
Chapter 12	References: Provides a list of reference material consulted in the report.

2. Project Team

Applicant

Details of the Applicant are as follows:

Applicant	Transnet Group Capital
Contact Person	Mr Willie van Dyk
Postal address	P.O. Box 1545; Bellville; 7535
Telephone	(022) 703 2450
E-mail address	willie.vandyk@transnet.net

Environmental Assessment Practitioner

Details of the EAP are as follows, and the associated CV is enclosed in Appendix G, as required in terms of Appendix 1 (3) (a) (ii) of the EIA Regulations (2014) as amended:

Environmental Consultant	AECOM SA (Pty) Ltd
EAP	Mr Johan Hayes
Postal Address	PO Box 3173, Pretoria, 0001
Telephone	+27 12 421 3500
E-mail Address	Johan.Hayes@aecom.com

Johan Hayes, Africa Practice Lead: Environmental Management and Permitting, Environmental Services is the EAP and is responsible for providing legal and technical guidance on the BA Process and ensure the professional quality of the project reports. Johan Hayes obtained an Honours Degree in Zoology, followed by an MSc degree in Ecological Assessment from the University of Stellenbosch. He is a registered professional scientist (Pri.Sci.Nat) in Environmental Sciences with the South African Council for Natural Scientific Professions (SACNASP) and a member of the International Association for Impact Assessment (IAIA).

Johan has been involved in the environmental management field since 2002, and has worked in sectors of transportation, electricity generation and transmission, water and waste management, infrastructure and mining. His experience includes feasibility studies, conducting environmental and social impact assessments in compliance with local and international standards, due diligence studies, environmental compliance reviews and project management. International experience includes projects located in Lesotho, Kazakhstan, Sierra Leone, Liberia, Ghana, Mozambique, Cote d'Ivoire, Democratic Republic of the Congo, Kenya, Tanzania and Burkina Faso.

Summary

The project team that contributed towards this assessment is presented in Table 2. Collaboration with Transnet and the Project Engineers was important to ensure the accuracy of project-related information and enhanced the comprehensiveness of the BA process.

Table 2: Project Team

Name	Role	Company
Engineering Team		
Andre Barnard	Project Engineer	AECOM
EAP Team		
Johan Hayes	EAP	AECOM

Name	Role	Company
Bharat Gordhan	Project manager and Senior Environmental Scientist	AECOM
Nicole Bates	Senior Environmental Technologist	AECOM
Specialists		
Peter Kimberg	Biodiversity Assessment	The Biodiversity Company
Andrew Husted	Wetland Assessment	The Biodiversity Company
David Morris	Heritage Impact Assessment	McGregor Museum
John Almond	Palaeontological Assessment	Natura Viva cc

3. Project Overview

Need and Desirability / Motivation for the Activity

The demand for Manganese exports through the Ore Line is significantly more than what Transnet is currently transporting. De-bottlenecking the current capacity restrictions on the Ore line will enable Transnet to meet the markets demand for increased manganese transportation via rail.

Manganese volumes on the Ore line are expected to ramp up from 2 mega tonnes per annum (MTPA) to approximately 4 MTPA in the immediate to short-term. The current bottlenecks in the system need to be removed to enable this ramp up. For Transnet to rail 4 MTPA of manganese via the ore line and to sustain these volumes and efficiencies, it is required to address the current challenges experienced in turning around the trains at Haakbosleegte near Sishen.

Thirty trains per week arrive in a southerly direction at Haakbosleegte and leave in a northerly direction. The turnaround of these thirty manganese trains at Haakbosleegte poses significant safety risks as well as delays on the Manganese traffic to Port Elizabeth and Ore / Manganese traffic to Gauteng.

To eliminate this bottleneck it is proposed to construct a northern direct rail link of approximately 2.1 km between the Manganese and Ore lines, as shown in Figure 1. This will enable the Manganese traffic from Hotazel area to run directly into Erts yard at Sishen and then onto the Ore line.

South Africa accounts for approximately 80% of the global manganese resources with most of the commodity being exported (Chamber of Mines of South Africa, 2017). A more efficient method of transporting commodities to the harbour for export purposes as well as creating multiple streams for manganese export would thus affirm the current market share of South Africa and meet the current high demand for the commodity.

The employment opportunities for the project are restricted based on the skills required for the project's construction. However, where there are opportunities for low-skills required as part of the Contractor's team, the EMPr (Appendix F) refers to the preference for sourcing such from the local communities nearby.

Locality of the Proposed Development

The proposed development is located in the Gamagara Local Municipality, which forms part of the John Taolo Gaetsewe District Municipality of the Northern Cape Province.

The municipal area of Gamagara consists of five towns, Kathu, Shesheng, Dibeng, Dingleton, and Olifantshoek, a large farming area and a considerable mining area. The single largest factor that has guided the development of the Gamagara area is the iron ore mine at Sishen. Not only does the mine provide jobs to thousands of people, but it was also the reason for the establishment of the town of Kathu. Kathu is the largest town within the municipality and is also the administrative centre of the Gamagara Local Municipality. Olifantshoek is the second largest town and is of the Gamagara River to the northwest of Kathu. Dingleton is the smallest of the 5 towns and is located in the centre of the mining activities directly south of Kathu.

The proposed development will traverse the following properties, and shown in Figure 1:

- Property 1: Portion 0 of Farm Sishen 543, as owned by Sishen Iron Ore Company (Pty) Ltd.
- Property 2: Portion 1 of Farm Sishen 543, as owned by Sishen Iron Ore Company (Pty) Ltd.
- Property 3: Portion 3 of Farm Bruce 544, as owned by Transnet.
- Property 4: Portion 0 of Farm King 561, as owned by Assmang (Pty) Ltd.
- Property 5: Portion 3 of Farm King 561, as owned by Transnet.
- Property 6: Portion 6 of Farm King 561, as owned by Transnet.
- Property 7: Portion 2 of Farm Parson 564, as owned by Assmang (Pty) Ltd.

The SG Codes for each of the properties are given in Table 3.

Table 3: SG 21 Digit codes of the affected properties

Property	SG Office	Major Region					Minor Region					Erf/ Farm Number				Portion Number						
1.	C	0	4	1	0	0	0	0	0	0	0	0	0	0	5	4	3	0	0	0	0	0
2.	C	0	4	1	0	0	0	0	0	0	0	0	0	0	5	4	3	0	0	0	0	1
3.	C	0	4	1	0	0	0	0	0	0	0	0	0	0	5	4	4	0	0	0	0	3
4.	C	0	4	1	0	0	0	0	0	0	0	0	0	0	5	6	1	0	0	0	0	0
5.	C	0	4	1	0	0	0	0	0	0	0	0	0	0	5	6	1	0	0	0	0	3
6.	C	0	4	1	0	0	0	0	0	0	0	0	0	0	5	6	1	0	0	0	0	6
7.	C	0	4	1	0	0	0	0	0	0	0	0	0	0	5	6	4	0	0	0	0	2

Landowner consent is not required in terms of Section 39 (2) (a) of the EIA Regulations (2014) as amended, as the development is linear in nature.

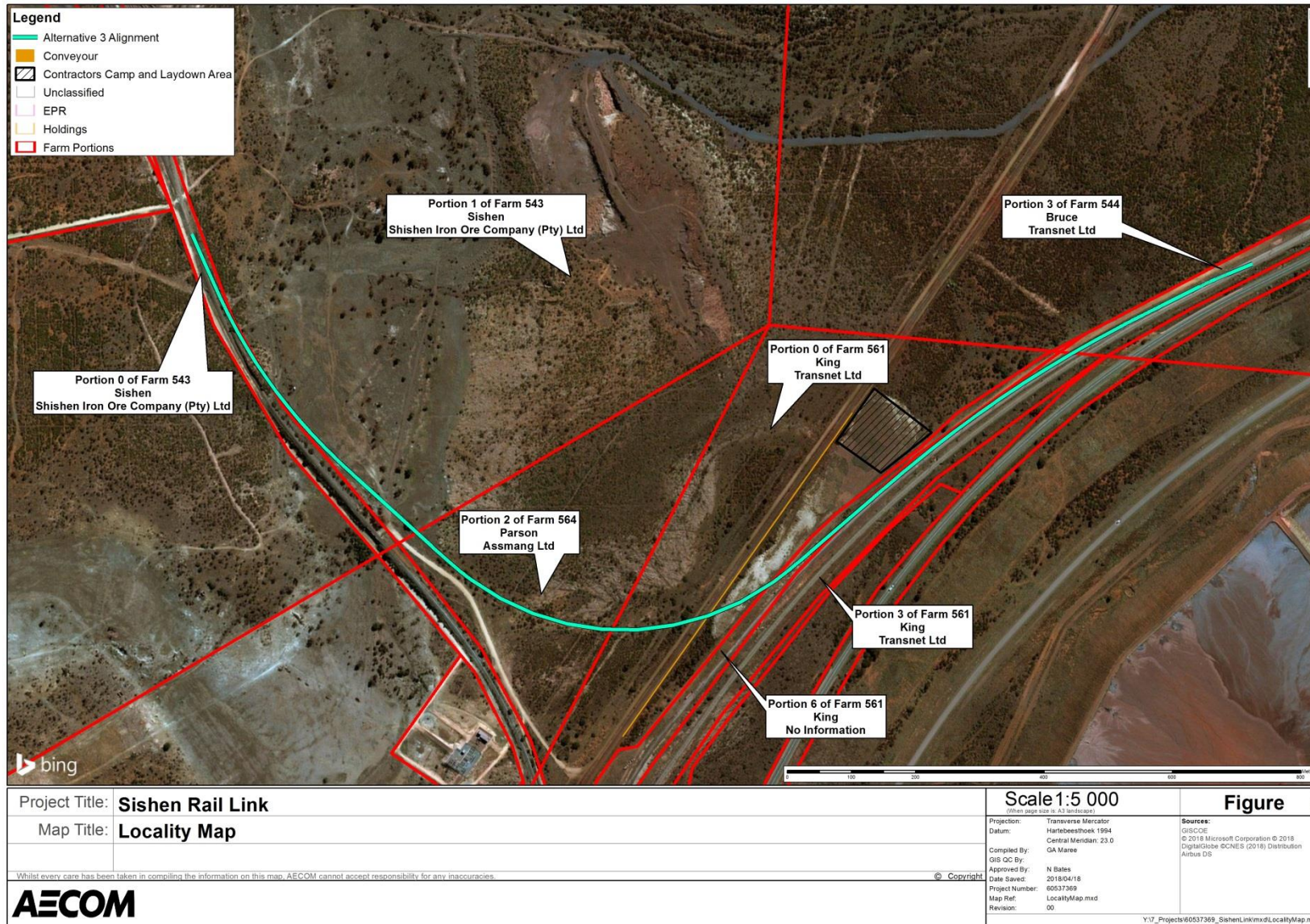


Figure 1: Locality Map for the proposed Sishen Rail Link

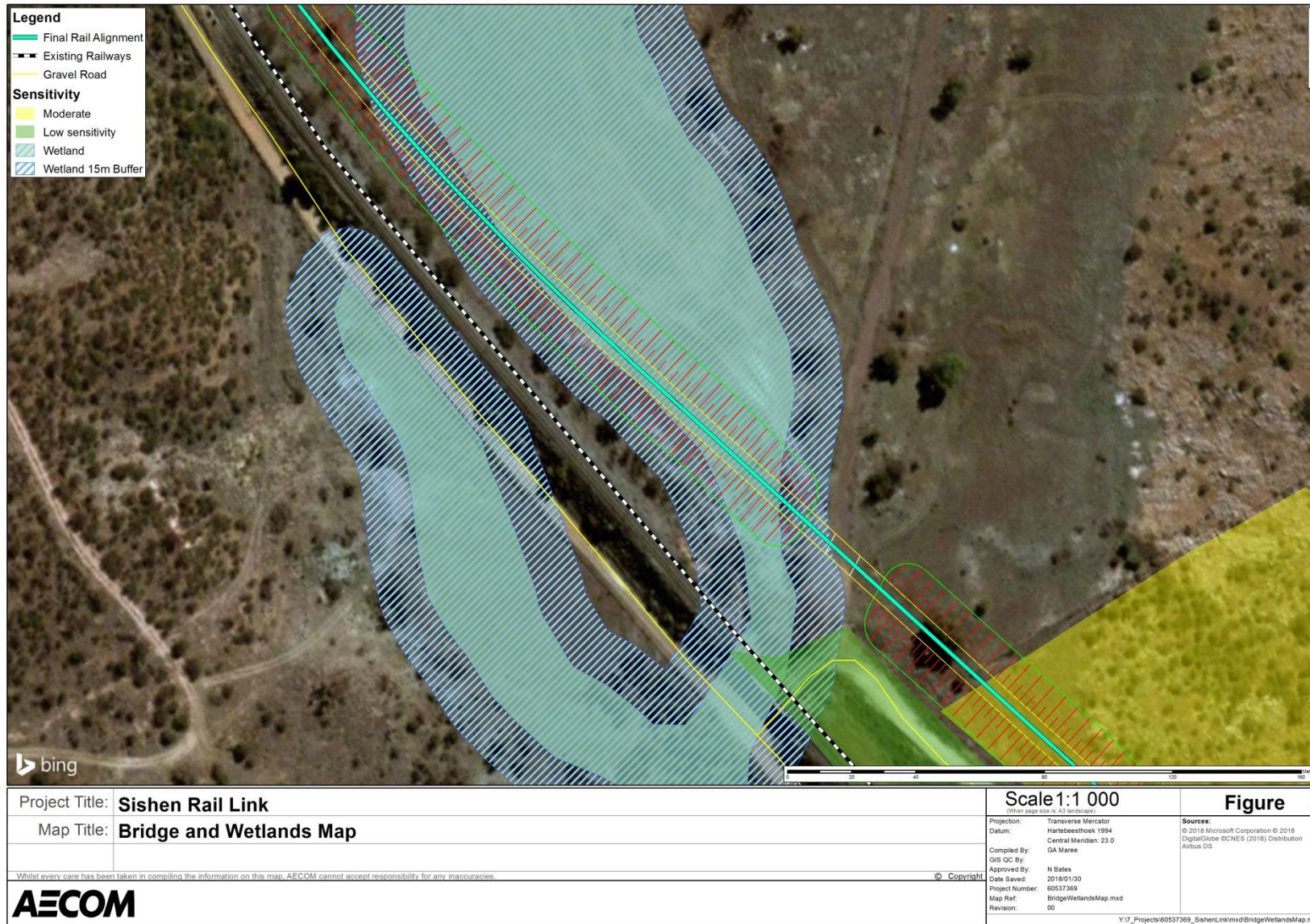


Figure 2: Proposed Bridge over Wetland Area

Project Description

The new Sishen Rail Link will be constructed to link two existing rail lines in order to provide operational flexibility to Transnet's rail operations in the Kathu area. The rail link will be approximately 2.1 km long and has been designed to accommodate trains with a 30 ton axle load. The rail line will be constructed mostly on a fill embankment. At the two ends where the rail line will join the existing rail lines the existing drainage structures will be extended in order to allow the water to pass through underneath the rail lines.

The proposed construction of the northern direct rail link between the Manganese and Ore lines would need to cross an existing watercourse (wetland system). Therefore, this would entail the construction of a new railway bridge across the watercourse. Refer to Figure 2. The new bridge that will be constructed has been designed to allow the stormwater to follow the existing drainage line.

The bridge is a three span bridge consisting of 10 m spans and has a deck width of 7 m. The main purpose of the bridge is to carry the new rail line over the existing watercourse. The substructure of the bridge consists of solid wall type pier and abutments, with the rail line fill contained through slayed wing walls. The superstructure of the bridge will be constructed as a cast *in-situ* solid slab type deck. It is expected that the bridge will be founded through spread footings on rock. The concrete used to construct both the sub and superstructure will be from ready mix concrete. It is expected that the bridge will be founded through spread footings on rock.

The proposed project also entails the following construction activities:

- Construction camp, site office and laydown areas, as described in Section 0 below.
- Site clearing and bulk earthworks, roadbed preparations and construction of drainage structures. Approximately 8 000 m³ of topsoil would be removed beneath the rail formation. The vegetation is removed to ensure the future stability of the rail formation. If the vegetation is not removed beneath the rail formation, the vegetation would biodegrade and cause voids beneath the rail formation, which could put the rail formation at risk of collapse. There would be no spoil sites required as part of the site clearing and preparing the cut and fill operations. Transnet would need to consider donating the topsoil material for rehabilitation purposes.
- Due to the topography in the study area, the volume of cut material would not be equal to the volume of fill material. The volume of cut material is anticipated at 21 700 m³, while the fill material required is anticipated at 81 900 m³. Therefore, approximately 60 200 m³ of fill material would need to be imported from commercial sources to construct the embankment for the rail formation. The commercial sources are from existing registered borrow pits within the study area, and locations yet to be determined. No new borrow pits would be established for this purpose.
- Embankment and bridge construction where bridges and culverts are needed to carry the rail line over a wetland system. The bridge will be a three-span bridge consisting of 10 m spans with a deck width of 7 m. The substructure of the bridge will consist of solid wall type pier and abutments, with the rail line fill contained through slayed wing walls. The superstructure of the bridge will be constructed as a cast *in-situ* solid slab type deck. It is expected that the bridge will be founded through spread footings on rock. The concrete used to construct both the sub and superstructure will be from ready mix concrete.
- Laying concrete sleepers and rail tracks – concrete rail sleepers are placed along the rail alignment as a base support for the rail. The steel rail is placed on top of the concrete sleepers and clipped into place by either a track mountable machine. Ballast is placed between the rail tracks and alongside the sleepers.
- Installation of over-head equipment – masts are installed along the rail alignment to support the equipment which provides electricity to operate trains, this includes signalling structures.

Size of the Project Area

The length of the rail link activity is approximately 2.1 km with a ballast width of 4.55 m and therefore a total area of approximately 9 582 m². The project laydown area shall include a total area of approximately 10 000 m² and is indicated on Figure 1 in black. The allocated laydown area was chosen based on its previously disturbed land use.

Servitudes

Although the land is currently owned by Assmang, a rail servitude will be registered in favour of Transnet.

Site access

Existing unnamed tarred and service roads will be used for access during the construction and operational phases of the project, as shown in Figure 1. No new access roads will be required for the proposed project.

Site / route plan

Refer to Appendix A for maps indicative of the site or route plan for the proposed activity alignments.

The Construction Process

Site office and laydown area

The Contractor will require a site office and laydown area for the duration of the contract period. The Contractor's site office and laydown area shall be located at the area marked in black diagonal lines in Figure 1. This designated area falls within the same Portion 00000 of Farm 561 KING and is owned by Assmang (Pty) Ltd and is a maximum of one hectare in size. Access to the site office and the laydown area would be from the N14.

All construction activities, materials, equipment and personnel will be restricted to within the area specified. All materials are stored at the construction camp. The site office and laydown area will be fenced and accessed controlled.

Construction camp

A construction camp for the accommodation of migrant skilled workers will not be required. Local labour will be used, especially for lesser skilled contract workers such as flag men / women, general labourers, security personnel and store men / women. The Contractor's labour would source accommodation in nearby areas such as Kathu.

Construction activities

Construction planning and coordinating delivery of construction materials and equipment will be undertaken to reduce travel costs and fuel usage. The construction process is outlined in Table 4 and is anticipated to take approximately 12 months.

Table 4: Construction process for the proposed project

Activity	± Duration of the activity
Civil Works	
1. Site establishment	2 weeks
2. Site clearing and topsoil strip	2 weeks
3. Bulk earthworks	4 weeks
4. Roadbed preparation	2 weeks
5. Drainage structures	8 weeks
6. Construction of Spoonnet type B-layer	2 weeks
7. Construction of Spoonnet type A-layer	2 weeks
8. Construction of Spoonnet SB layer	2 weeks
9. Construction of Spoonnet SSB layer	2 weeks
10. Foundations for overhead electrification masts	4 weeks

Activity	± Duration of the activity
Bridge Construction	
11. Foundation construction	8 weeks
12. Abutments	12 weeks
13. Piers	10 weeks
14. Deck	12 weeks
15. Railing	2 weeks
Track Work	
16. Construct turnouts in existing rail lines	2 weeks
17. Track Work	8 weeks
Project Closure	
18. Snagging / de-snagging	2 weeks
19. De-establishment	2 weeks

Waste and Effluent

The proposed project may result in the generation of solid construction waste. However, it is not envisaged that the waste volumes generated would trigger the thresholds as prescribed in terms of the National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA).

The clear and grub activities would entail the removal of topsoil. The topsoil would not be stored on site or spoiled at any specific area. Rather, Transnet would need to consider donating the topsoil material for rehabilitation purposes.

Waste resulting from construction activities will be collected and disposed of at a registered landfill site as per regulatory requirements. Landfill sites are located within Sishen South and Kathu. It is anticipated that no effluent will be generated during construction and operation of the proposed project. Refer to the Draft EMPr (Appendix F) for detailed waste and effluent management measures proposed during construction.

Water Requirements and Use

The appointed construction Contractor will be responsible for his own arrangements regarding the supply of water for construction purposes. The water required for the 12-month construction period is approximately 1 638 m³.

Transnet would have to obtain a water use license for construction within a wetland area from the Department of Water and Sanitation (DWS) as required in terms of the NWA. The following water uses are being applied for:

- Section 21 (c): impeding or diverting the flow of water in a water course; and
- Section 21 (i): altering the bed, banks, course or characteristics of a water course.

Refer to the Draft EMPr (Appendix F) for recommended water use management measures. As a Section 21 (a) water use will not be applied for, the Contractor will not be permitted to abstract water from any of the watercourses. It is further understood that construction water will be sourced by the Contractor through legal means and in compliance with the NWA.

Energy Efficiency

The activity is expected to have minimal energy requirements; as such no alternative energy sources have been identified at this time. The contractor will be advised to avoid multiple trips when transporting equipment during construction. The transportation of materials can be done simultaneously with other activities or where possible transport all construction materials at the same time.

4. Description of Alternatives

"Alternatives are different means of meeting the general purpose and need of a proposed activity. The identification, description, evaluation and comparison of alternatives are important for ensuring the objectivity of the assessment process. In cases where there is no objective and thorough assessment of alternatives, the EIA process usually only confirms a chosen activity and the value of the assessment as an input to a decision-making may be compromised" (DEAT, 2006). This chapter presents considerations for different possible means of meeting the general purpose and need of the proposed activity.

The criteria used to assess the alternatives are dependent on specialist planning, environmental, social, engineering and economic inputs. The alternatives assessed are based on the description of the proposed development which includes technically feasible and unfeasible alternatives of the following:

- Alignment Alternative 1 is reflected as the purple line in Figure 1. This is a technically unfeasible alternative.
- Alignment Alternative 2 is reflected as the pink line in Figure 1. This is a technically feasible alternative.
- Alignment Alternative 3 is reflected as the blue line in Figure 1. This is a technically feasible alternative and is the recommended alternative.

This section describes the alternatives that were initially considered by Transnet but are not necessarily feasible from a technical perspective. The sensitivities associated with each of the alternatives are also presented in Figure 3.

Alignment Alternative 1

Alignment Alternative 1 was identified as the shortest technically feasible route to connect the two existing Manganese and Ore railway lines. When considering the construction of the fill embankment and this alignment would not be feasible to construct as the vertical alignment (heights) of the Manganese and Ore railway lines would need to match, which doesn't on this alignment.

The vertical alignment of the railway line is an important consideration due to the restrictions placed on the control of the train, allowing for the breaking of trains, load considerations, among other factors. Therefore, the vertical alignment between the connection points of Alignment Alternative 1 would not be feasible as the heights of the Manganese and Ore railway line are different.

Therefore, this alignment is not considered feasible and would thus not be considered as part of this process any further.

Alignment Alternative 2

Alignment Alternative 2 was based on the correct vertical alignment between the existing railway lines, as explained above. The western connection point was thus moved further north to maintain an appropriate vertical alignment across the linking railway line. The eastern connection point was kept the same as for Alignment Alternative 1. This remains a technically feasible alternative, subject to further interrogation from an environmental perspective.

The crossing of the wetland area is unavoidable for this alignment, resulting in the consideration of a water use licence for this alignment (refer to Section 0).

Alignment Alternative 3

Alignment Alternative 3 was considered based on the identification of the ecological support areas (ESA) from the Biodiversity Assessment (Appendix C-1). Although the vegetation rated as highly significant is unavoidable, Alignment Alternative 3 is placed on the edge of the ESA of high significance and does not allow for further fragmentation of this ESA. This alignment strikes a balance between the technically feasible alignment and the construction within the ESA of high significance. Thus, this alternative is the best practicable environmental alternative to consider for the proposed Sishen Rail Link project.

The crossing of the wetland area is unavoidable for this alignment, resulting in the consideration of a water use licence for this alignment (refer to Section 0).

No-go Alternative

The no-go alternative is considered in cases where the proposed activity will have a significant negative impact that cannot be avoided and/or effectively or satisfactorily mitigated. If the no-go alternative were to be considered, the northern direct rail link between the Manganese and Ore lines would not be constructed. Therefore, this would result in the current bottleneck of demand on the current capacity restrictions on the Ore line continuing and eventually escalating. The result is that Transnet would not be able to meet the customer demand that is anticipated for 2017/2018 onward of 4 MTPA.

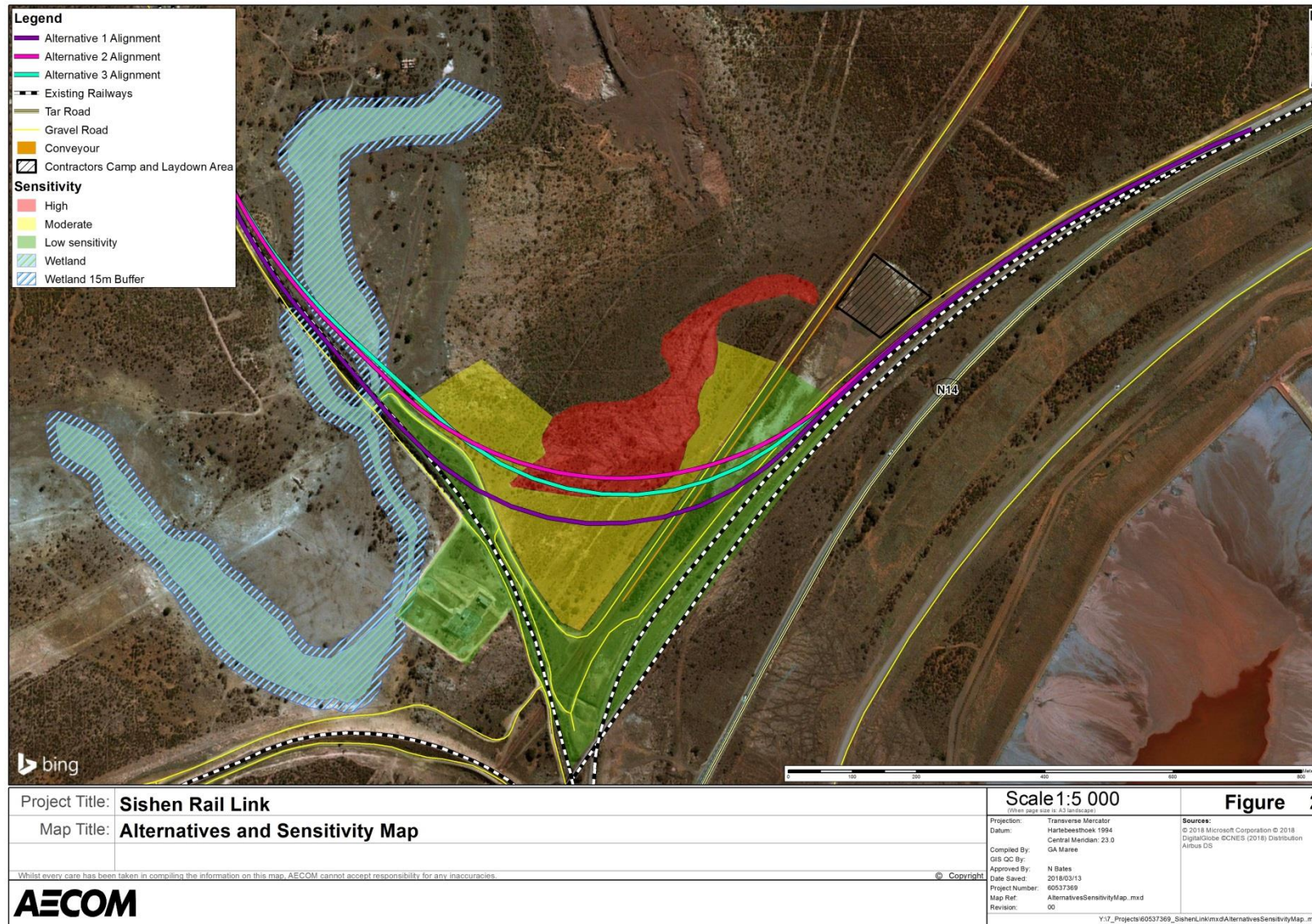


Figure 3: Alternatives and Sensitivity Map

5. Legislation and Guideline Documents

This chapter provides information on environmental legislation and guideline documents relevant to the proposed project.

National Environmental Management Act, 107 of 1998

The NEMA provides a framework for cooperative environmental governance between the various spheres of government by establishing principles for decision-making on matters relating to the environment. The NEMA also promotes integrated management to ensure sustainable resource utilisation and development, and requires that the Department of Environmental Affairs (DEA) be the lead agent in ensuring effective custodianship of the environment. It acknowledges that sensitive, vulnerable, highly dynamic or stressed ecosystems, such as wetlands and similar systems, require specific attention in management and planning procedures, especially where subjected to significant human resource usage and development pressure. The DEA is the approving authority in this proposed project.

The NEMA principles (contained in Section 2) guide the interpretation, administration and implementation of the Act and any other law concerned with the protection of the environment. Its overarching emphasis is that development must be environmentally, socially and economically sustainable. The Act also states that sustainable development requires the consideration of, inter alia, the following:

- That pollution and degradation of the environment are avoided, or where it cannot be altogether avoided, minimised and remedied;
- That waste is avoided, or where it cannot be altogether avoided, is minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- That the development, use and exploitation of renewable resources and the eco-systems of which they are part do not exceed the level beyond which their integrity is jeopardised; and
- That negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where it cannot be altogether prevented are minimised and remedied.

The NEMA principles apply to all activities that may significantly affect the environment and serve as guidelines by reference to which organs of state will exercise their functions when taking a decision in terms of the NEMA.

Sections 24 and 44 of the NEMA make provision for the promulgation of Regulations that identify activities which may not commence without environmental authorisation (EA). The result being that the NEMA began governing the EIA process with the promulgation of the EIA Regulations in April 2006 (Government Gazette No. 28753 of 21 April 2006). These Regulations have been replaced by the NEMA EIA 2010 and then subsequently replaced by NEMA EIA 2014 Regulations listed in Government Gazette No. 38282 of 04 December 2014 (GNR No. 982, 983, 984 and 985) (as amended).

On submission of an application the competent authority must consider all the relevant information contained in the BAR (including any pollution, environmental impacts or environmental degradation likely to be caused if the application is approved or refused) and thereafter make a decision of whether or not to grant an EA to the proposed project.

Certain minimum conditions are attached to the EA, as required by Section 24E of the NEMA. However, it is at the competent authority's discretion to include additional project specific conditions. In terms of Section 24F of the NEMA, it is an offence not to comply with any condition applicable to an EA issued for a listed activity.

Typical conditions that may be applied by the competent authority include:

- Measures to prevent, manage and mitigate environmental impacts to acceptable levels;
- Prevention of pollution of water bodies and groundwater;
- Rehabilitation programme for disturbed natural and/or heritage areas;
- Appointment of an independent Environmental Control Officer (ECO) to oversee the construction phase and to ensure that the development phase is conducted in an environmentally responsible manner;
- Conservation management and visitor management plans; and
- Requirements of other authorities, such as the DWS, the Department of Energy (DoE), the Department of Agriculture, Forestry and Fisheries (DAFF), the Department of Mineral Resources (DMR), SAHRA and/or relevant provincial authorities.

Activities Applicable to the NEMA

The construction activities associated with the project fall within the ambit of the list of activities (Table 5) identified in terms of Sections 24(2) (a) and (d) of the NEMA. The list of applicable activities requires that a BA process be undertaken in support of an EA; none of the activities of the proposed project require a S&EIR Process.

Table 5: Listed Activities in terms of the NEMA

Activity	Description of activity	Description of Activities Applicable
GNR 983, 04 December 2014 (as amended) (Listing Notice 1, Basic Assessment) as amended		
19	The infilling or depositing of any material of more than 10 m ³ into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m ³ from a watercourse.	The bridge is a three span bridge consisting of 10 m spans and has a deck width of 7 m. The main purpose of the bridge is to carry the new rail line over the existing watercourse. The proposed activity would thus entail the infilling, depositing, excavation, removal or moving of more than 10 m ³ of material within the wetland area associated within the seasonal Gamagara River.
64	The expansion of railway lines, stations or shunting yards where there will be an increased development footprint, excluding— i. railway lines, shunting yards and railway stations in industrial complexes or zones; ii. underground railway lines in mines; or iii. additional railway lines within the railway line reserve.	The project entails the linking of two railway lines in Sishen over approximately 2.1 km in length. It is understood that this would constitute an expansion of the railway reserve to accommodate this link. None of the exclusions apply to this definition. As this is not a new railway line, Item 12 of GN R984 will not apply.
GNR 985, 04 December 2014 (as amended) (Listing Notice 3, Basic Assessment) as amended		
12	The clearance of an area of 300 m ² or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (g) Northern Cape i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; iii. Within the littoral active zone or 100 m inland from high water mark of the sea or an estuary, whichever distance is the greater, excluding where such removal will occur behind the development setback	The length of the rail link activity is approximately 2.1 km with a ballast width of 4.55 m and therefore a total area of approximately 9 582 m ² . The project laydown area shall include a total area of approximately 10 000 m ² . Site clearing and bulk earthworks, roadbed preparations and construction of drainage structures. Approximately 8 000 m ³ of topsoil would be removed beneath the rail formation. The proposed activity is located within an Ecological Support Area, which follows the wetland area associated within the seasonal Gamagara River. The area required for clearing within the Ecological Support Area exceeds 300 m ² , as per this listed activity.

Activity	Description of activity	Description of Activities Applicable
	line on erven in urban areas; or iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.	There are no national / world heritage sites located within 10 km of the site.
14	The development of: ii. infrastructure or structures with a physical footprint of 10 m ² or more, where such development occurs (a) within a watercourse; (g) Northern Cape ii. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an international convention; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Core areas in biosphere reserves; (hh) Areas within 10 km from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (ii) Areas seawards of the development setback line or within 1 km from the high-water mark of the sea if no such development setback line is determined;	The length of the rail link activity is approximately 2.1 km with a ballast width of 4.55 m and therefore a total area of approximately 9 582 m ² . The project laydown area shall include a total area of approximately 10 000 m ² . The bridge is a three span bridge consisting of 10 m spans and has a deck width of 7 m. The main purpose of the bridge is to carry the new rail line over the existing watercourse. The bridge over the watercourse thus exceeds a physical footprint of 10 m ² within the watercourse. The proposed activity is located within an Ecological Support Area, which follows the wetland area associated within the seasonal Gamagara River. There are no national / world heritage sites located within 10 km of the site.

National Heritage Resource Act, 25 of 1999

The National Heritage Resources Act (No. 25 of 1999) (NHRA) is the primary statute regulating the protection and management of South Africa's heritage resources. The NHRA aims to promote good management of the national estate, and ensures community participation in the protection of national heritage resources and involves all three levels of government (national, provincial and local) in the management of the country's national heritage. SAHRA is the enforcing authority for the NHRA. The national estate includes, but is not limited to places, buildings, structures and equipment of cultural significance, places to which oral traditions are attached or which are associated with living heritage; historical settlements and townscapes, landscapes and natural features of cultural significance, geological sites of scientific or cultural importance, archaeological and paleontological sites, graves and burial grounds, and sites of significance relating to South African history and movable objects.

A variety of formal protection measures are provided for in the NHRA, ranging from national and provincial heritage sites, protected areas, provisional protection, inclusion on the heritage register of a province, heritage areas and heritage objects legal protection of paleontological and archaeological sites (including rock art) and meteorites, burial grounds and graves, and the protection of structures older than 60 years and public monuments and memorials.

Applicants must contact the SAHRA or the relevant authorised provincial agency to ascertain which properties and objects are formally protected by the Act and how any future development would impact on these heritage resources. Formal permit applications or authorisations would be required from the relevant heritage resource management authority to make changes to heritage resources. In the case of any built environment features, the approving authority is the Northern Cape Heritage Authority (previously called Ngwao Boswa jwa Kapa Bokone).

In terms of Section 34 (1) of the National Heritage Resources Act, 1999, 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.

Table 6: Listed activities in terms of NHRA

Activity Number	Description of Activity
1 (a)	the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length
1 (b)	the construction of a bridge or similar structure exceeding 50m in length

The provisions of Section 38 of the NHRA provide that the Applicant is responsible for contacting SAHRA at the earliest stages of initiating a development and for furnishing the SAHRA with details relating to the proposed project. The information is provided for the reason that SAHRA can determine if a Heritage Impact Assessment (HIA) is required. The following activities listed the NHRA apply to the proposed site project:

- National heritage sites, areas and objects;
- Provincial heritage sites, areas and objects;
- Protected areas;
- Structures;
- Archaeology, palaeontology, meteorites;
- Burial grounds and graves; and
- Public monuments and memorials.

An exemption application from a complete HIA was submitted to the SAHRA on 20 November 2017. However, the SAHRA confirmed that a complete HIA and a Paleontological Assessment must be undertaken, as per the letter dated 15 December 2017. A HIA is thus compiled and included in Appendix C-3 and the Palaeontological Assessment is included in Appendix C-4.

The various categories of heritage resources recognised as part of the National Estate in Section 3 of the NHRA include, among others:

- Geological sites of scientific or cultural importance;
- Palaeontological sites; and
- Palaeontological objects and material, meteorites and rare geological specimens.

According to Section 35 of the NHRA, dealing with archaeology, palaeontology and meteorites:

- The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
- All archaeological objects, palaeontological material and meteorites are the property of the State.
- Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
- No person may, without a permit issued by the responsible heritage resources authority—
 - Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
 - Destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
 - Trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

- Bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
- When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—
 - Serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
 - Carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
 - If mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
 - Recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Minimum standards for the palaeontological impact assessment have been published by SAHRA (2013).

National Water Act, 36 of 1998

The NWA provides a framework to protect, develop, conserve and manage the nation's water resources. Water use is defined broadly in terms of the NWA, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. In general a water use must be licensed (in terms of Section 21) unless it is listed in Schedule 1, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. Section 21 of the NWA lists the water uses for which authorisation under the Act is required.

The NWA also provides for pollution prevention measures, with particular emphasis on water resource pollution. In accordance, the licensee shall ensure that activities impacting upon water resources and effluent releases are monitored for compliance with the applicable Regulations. Emergency incidents involving water resources are included in the Act, requiring the polluter to remediate and mitigate the impacts of such an emergency incident.

In terms of Section 19 of the NWA, "an owner of land, a person in control of land or a person who occupies or uses the land on which any activity or process is or was performed or undertaken; or any other situation exists, which causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring". These measures may include, but are not limited to:

- Measures to cease, modify, or control any act or process causing the pollution.
- Compliance with any prescribed waste standard or management practice.
- Containment or prevention of the movement of pollutants.
- Remediation of the effects of the pollution.
- Remediation of the effects of any disturbance to the bed and banks of a watercourse.

The applicable water uses in terms of Section 21 of the NWA are shown in Table 7. The construction of the railway link will have a direct impact on the delineated wetland area. Section 0 provides a rationale for the General Authorisation (GA) of the water uses in terms of GNR 509 of 26 August 2016, as opposed to a comprehensive Water Use Licence Application (WULA).

Table 7: Listed activities in terms of NWA (General Authorisation)

Activity Number	Description of Activity
21 (c)	Impeding or diverting the flow of water in a watercourse.
21 (i)	Altering the bed, banks, course or characteristics of a watercourse.

Other Applicable Environmental Legislation

A screening of relevant legislation was undertaken to identify the key legal issues related to the proposed project. Additional legislation to be considered during the implementation of the proposed project is summarised in Table 8 below.

Table 8: Summary of Other Applicable Legislation

Legislation	Sections	Relates to:
The Constitution (No. 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights
	Section 25	Rights in property
	Section 32	This section provides that every person has the constitutional right of access to information held by the state, including for example a state department such as the DEA, and any information held by another person in so far as that information is required for the exercise or protection of any of their rights, including their environmental right.
	Section 33	The Constitution entitles everyone to administrative action that is lawful, reasonable and procedurally fair and if one's rights have been adversely affected by administrative action one has the right to be given written reasons for the decision.
Environment Conservation Act (No. 73 of 1989) and Regulations	Although the Environment Conservation Act has been substantially repealed by the NEMA and the NEM:WA, certain Regulations promulgated under the Act remain in effect. Of importance are the National Noise Control Regulations.	
National Environmental Management: Protected Areas Act (No. 57 of 2003) (NEM:PAA)	The NEM:PAA was signed into law on 18 February 2004, and came into operation on 01 November 2004.	
	The aim of the Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity, natural landscapes and seascapes. The Act operates in conjunction with the NEM:BA.	
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Sections 65-69	These sections deal with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to alien species.
	Sections 71 and 73	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species.
	Alien and Invasive Species Regulations in terms of section 97 (1).	
	Chapter 2	Categories of listed invasive species.
Conservation of Agricultural Resources Act (No. 43 of 1983) and Regulations	Sections 2, 5, 6	Implementation of control measures for soil conservation works as well as alien and invasive plant species in and outside of urban areas.
National Environmental Management: Air Quality Act (No. 39 of 2004)	The provisions of this Act would only be applicable during the construction phase of the project	
	Section 32	Measures for the control of dust
	Section 34	Measures for the control of noise
	Section 35	Measures for the control of offensive odours
	Chapter 5	Licensing of listed activities
	Schedule 2	Ambient air quality standards
National Environmental Management: Waste Act	Section 16	General duty in terms of waste management
	Section 17	Reduction, re-use, recycling and recovery of waste

Legislation	Sections	Relates to:
(No. 59 of 2008)	Section 20	No person may commence, undertake or conduct a waste management activity, except in accordance with: <ul style="list-style-type: none"> the requirements or standards prescribed by said Act and Regulations; and a waste management licence issued in respect of that activity, if a licence is required.
	Section 26	Prohibition of unauthorised disposal of waste
	Section 27	Prohibition of littering
Occupational Health and Safety Act (No. 85 of 1993) and Regulations	General Administration Regulations GN R929 of June 2003	Material Safety Data Sheets must be made available at the request of any interested or affected party.
	Section 8	General duties of employers to their employees.
	Section 9	General duties of employers and self-employed persons to persons other than their employees.
Fencing Act (No. 31 of 1963)	Section 17	Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to the protection of flora.
Hazardous Substances Act (No. 15 of 1973)	Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances.	
National Road Traffic Act (No. 93 of 1996) and Regulations	Section 54	Transportation of dangerous goods.
Spatial Planning and Land Use Management Act (No. 16 of 2013)	<ul style="list-style-type: none"> Framework act for all spatial planning and land use management legislation. Provide for a uniform, effective and comprehensive system of spatial planning and land use management for the Republic. Ensure that the system of spatial planning and land use management promotes social and economic inclusion. Provide for development principles and norms and standards. Provide for the sustainable and efficient use of land. Provide for cooperative government and intergovernmental relations amongst the national, provincial and local spheres of government. Redress the imbalances of the past and to ensure that there is equity in the application of spatial development planning and land use management systems. 	
Land Survey Act (No. 8 of 1997)	To regulate the survey of land in South Africa.	

Policies and Guidelines

The BA process must consider the planning policies that govern the study area to ensure that the scale, density and nature of activities/developments are harmonious and in keeping with the sense of place and character of the area. The proposed environmental and infrastructure modifications must be viewed in the context of the planning policies from the following organisations:

- Gamagara Local Municipality Integrated Development Plan 2017-2022.
- Gamagara Local Municipality Spatial Planning and Land Use Management By-Law (2015).
- Public Participation in the EIA Process, NEMA EIA Regulations (2014) as amended, Chapter 6.
- NEMA Waste Act: Waste Classification and Management Regulations (GNR 634), 2013, DEA, Pretoria.
- NEMA Waste Act: National Norms and Standards for the Storage of Waste (GNR 926 of 29 November 2013, DEA, Pretoria.
- SANS 1929: Ambient air quality – limits for common pollutants.

- SANS 10103: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.

Authority Consultation

The DEA confirmed on 18 July 2017 that a pre-application meeting was not required as queries regarding the project could be addressed via email. E-mail correspondence was received from the DEA on 23 August 2017 based on the queries submitted. The following was confirmed:

- The DEA cannot confirm the number or type of specialist studies required and it is the duty of the EAP to determine the specialist studies to be conducted.
- Any investigative studies to be undertaken should not by themselves constitute a listed activity in terms of the EIA Regulations (2014) as amended.

6. Study Approach and Methodology

The BAR for the proposed project is being conducted in accordance with the process described in Regulation 19 and Appendix 1 of the EIA Regulations (2014) as amended, promulgated in terms of section 24(E) of the NEMA. The Draft BAR will be made available for public review, after which it will be revised based on comments received during the public review period, finalised and submitted a Final BAR to DEA. AECOM is responsible for the processing and collation of information from the specialist reports, including the issues raised during the Public Participation Process (PPP).

Assumptions and Limitations

The assumptions, limitations and constraints associated with the BA process for the proposed project are listed below:

Basic Assessment Process

- The BA process is multi-disciplinary, informed by the project team (Table 2). It is necessary to assume that the information provided by the project team is accurate and true at the time of writing the report;
- No significant changes to the project are anticipated with regards to the narrative on the receiving environment for the period between completion of the report and implementation of the proposed project; and
- Information regarding the project infrastructure was provided by the Applicant and the Project Engineer.

Wetland and Ecological Assessment

- The wetland baseline assessment was based on the results of one site visit, conducted during the dry season period. The dry conditions encountered during the survey would hinder the use of vegetation as a wetland indicator, thus emphasis was placed on soil form and topography.
- The GPS used for wetland delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side.
- Wetland systems identified at desktop level within 500 m of the project area were considered for the identification and desktop delineation, with wetland areas within the project area being the focus for ground truthing. The Wetland Assessment pertained particularly to the extent of development within the project area;

Heritage Assessment

- Due to the fact that most cultural remains may occur below surface, the possibility exists that some features or artefacts may not have been discovered / recorded during the survey and the possible occurrence of unmarked graves and other cultural material cannot be excluded.
- The easternmost extent of the proposed railway link (that indicated between roughly parallel red lines in Figure 4) could not be accessed because of mining restrictions, but it is noted that that zone (servitude) is heavily disturbed by an existing conveyor belt, as well as the existing railway and service road. Predictions about heritage resources potentially occurring there (should any survive) could be made on the basis of observations made in the adjacent landscape.
- It was assumed that, by and large in this landscape, with its shallow soil profiles, that some sense of the archaeological traces to be found in the area would be readily apparent from surface observations (including assessment of places of erosion that expose erstwhile below-surface features). It was not considered necessary to conduct excavations as part of the BA process to establish the potential of sub-surface archaeology. A major portion of the area examined consists of exposed bedrock/rocky ridge, where any archaeological traces present would occur on the surface.

- A proviso is routinely given, that should sites or features of significance be encountered during construction (this could include an unmarked burial, an ostrich eggshell water flask cache, or a high density of stone tools, for instance), specified steps are necessary (cease work, report to the SAHRA).

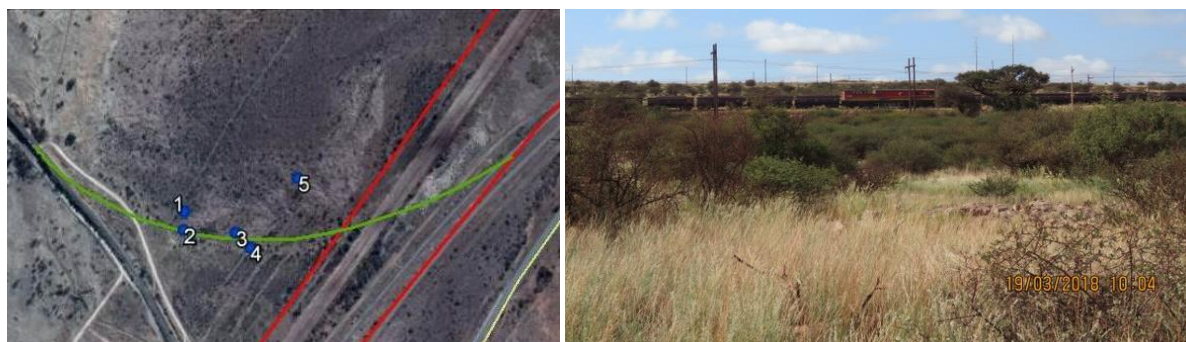


Figure 4: Fenced (red lines) Conveyor Belt indicating areas not surveyed for HIA

Palaeontological Assessment

The accuracy and reliability of palaeontological specialist studies as components of heritage impact assessments are generally limited by the following constraints:

- Inadequate database for fossil heritage for much of the RSA, given the large size of the country and the small number of professional palaeontologists carrying out fieldwork here. Most development study areas have never been surveyed by a palaeontologist.
- Variable accuracy of geological maps which underpin these desktop studies. For large areas of terrain these maps are largely based on aerial photographs alone, without ground-truthing. The maps generally depict only significant ("mappable") bedrock units as well as major areas of superficial "drift" deposits (alluvium, colluvium) but for most regions give little or no idea of the level of bedrock outcrop, depth of superficial cover (soil etc.), degree of bedrock weathering or levels of small-scale tectonic deformation, such as cleavage. All of these factors may have a major influence on the impact significance of a given development on fossil heritage and can only be reliably assessed in the field.
- Inadequate sheet explanations for geological maps, with little or no attention paid to palaeontological issues in many cases, including poor locality information.
- The extensive relevant palaeontological "grey literature" - in the form of unpublished university theses, impact studies and other reports (e.g. of commercial mining companies) - that is not readily available for desktop studies.
- Absence of a comprehensive computerized database of fossil collections in major RSA institutions which can be consulted for impact studies. A Karoo fossil vertebrate database is now accessible for impact study work.

In the case of palaeontological desktop studies without supporting Phase 1 field assessments these limitations may variously lead to either:

- Underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- Overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by tectonism or weathering, or are buried beneath a thick mantle of unfossiliferous "drift" (soil, alluvium etc.).

Since most areas of South Africa have not been studied paleontologically, a palaeontological desktop study usually entails inferring the presence of buried fossil heritage within the study area from relevant fossil data collected from similar or the same rock units elsewhere, sometimes at localities far away. Where substantial exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a Palaeontological Impact Assessment may be significantly enhanced through field assessment by a professional palaeontologist.

In the case of the study area near Sishen, little is known about local fossil heritage resources on the basis of field studies, while the Kathu area to the north is better known. A desktop-level assessment of palaeontological heritage resources is considered appropriate due to:

- The comparatively small footprint of the proposed development;
- The disturbed character of the context, and
- The generally low palaeontological sensitivity of the study area,

Approach for Specialist Studies

The following specialist studies have been undertaken in compliance with Regulation 13(1) of the EIA Regulations (2014). The methodology for each of the specialist studies is summarised in this section as well.

- Biodiversity Assessment (Appendix C-1);
- Wetland Assessment (Appendix C-2);
- Heritage Assessment (Appendix C-3); and
- Palaeontological Assessment (Appendix C-4).

Biodiversity Assessment

Peter Kimberg from The Biodiversity Company was appointed as the independent specialist to undertake the Biodiversity Assessment for this project. Refer to Appendix C-1 for the report completed.

The requirements of this assessment served to combine aspects of the regional vegetation community (obtained from Mucina and Rutherford 2006) with the field study in order to formulate a series of conclusions and subsequent recommendations. The following datasets and sources were reviewed for the study:

- The Vegetation of South Africa, Lesotho & Swaziland (Mucina & Rutherford, 2006, SANBI, 2012);
- The Southern Africa Bird Atlas Project (SABAP2, 2017) and BirdLife South Africa website (2017);
- Mammal information was referenced from the Animal Demography Unit (ADU, 2016), Skinner & Chimimba (2005) and the IUCN spatial database (IUCN, 2017); and
- Reptiles and amphibians were referenced from ADU (2016), Bates *et al.* (2014), Du Preez and Carruthers (2009) and the IUCN spatial database (IUCN, 2017) respectively.

The evaluation of species of concern was considered after the field study which served to identify their potential for occurrence. Therefore, all species identified under the above-mentioned references were not necessarily analysed in detail. Plants were identified using Van Oudtshoorn (2004) and Van Wyk & Van Wyk (1997).

The verification of the presence of red and orange listed plant species was one of the primary ecological requirements of the floral assessment.

A field survey was conducted on 7 and 8 September 2017 by 2 terrestrial ecologists where the floral and faunal communities in the project area were assessed. The timing of the study represented dry-season conditions which were sub-optimal for the identification of particularly vegetation diversity. The project area was ground-truthed on foot, which included spot checks in pre-selected areas to validate desktop data. Photographs were recorded during the site visit.

The fieldwork attempted to classify the fauna, flora and habitats, with emphasis on recording the actual and potential presence of Red Data species (also referred to as Red-Listed and Orange-Listed species), which are species of conservation concern in South African (either classified as threatened by the IUCN (2017), protected by NEM:BA (2004) or any other legislation applicable provincially or nationally).

The vegetation survey included the following:

- A survey for Red and Orange Data plant species;
- Compilation of an observed plant species list; and

- Assessment of the presence of the degree of transformation and encroachment by alien invasive vegetation.

The faunal survey included the following:

- Compilation of expected species lists;
- A survey of the terrestrial habitats within the proposed development area (where applicable);
- Compilation of identified species lists;
- Identification of any Red Data or listed species present or potentially occurring in the area;
- A proximity assessment to any protected or ecologically important areas; and
- Emphasis will be placed on the probability of occurrence of species of provincial, national and international conservation importance.

Wetland Assessment

Andrew Husted from The Biodiversity Company was appointed as the independent specialist to undertake the Biodiversity Assessment for this project. Refer to Appendix C-2 for the report completed.

The following information sources were considered for the desktop assessment;

- Information as presented by the South African National Biodiversity Institutes (SANBI's) Biodiversity Geographic Information Systems (BGIS) website (<http://bgis.sanbi.org>);
- Aerial imagery (Google Earth Pro);
- The Municipal Biodiversity Summaries Project (2010);
- Land Cover Data (2013 / 2014);
- Land Type Data (Land Type Survey Staff, 1972 - 2006);
- The National Freshwater Ecosystem Priority Areas (NFEPA) (Nel, *et al.*, 2011);
- Contour data (5m).

The wetland areas are delineated in accordance with the DWAF (2005) guidelines. Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and also then includes structural features at the lower levels of classification (Ollis *et al.*, 2013).

Once all HGM Units have been assessed, a summary of health for the wetland as a whole is calculated. Since hydrology, geomorphology and vegetation are interlinked their scores are aggregated to obtain an overall Present Ecological State (PES) health score (Macfarlane, *et al.*, 2009).

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al.*, 2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided.

The method used for the Ecological Importance and Sensitivity (EIS) determination was adapted from the method as provided by DWS (1999) for floodplains. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed.

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane *et al.* 2014) was used to determine the appropriate buffer zone for the proposed activity.

Heritage Assessment

An application for exemption was submitted to the SAHRA by ACO Associates in November 2017. The SAHRA responded on 15 December 2017 requesting a complete Heritage Impact Assessment (HIA) that includes a Phase 1 archaeological component. Dr David Morris from the McGregor Museum was appointed to undertake the archaeological component. Refer to Appendix C-3 for the report completed.

Heritage traces were evaluated in terms of their archaeological significance and were undertaken as follows:

- A desktop assessment was done of the development footprint relative to the known wider archaeological landscape.
- A search was done on SAHRIS database to determine what previous Archaeological and Heritage Impact studies existed for the area.
- Predictions were made which the study would test with observations made in the field.
- The study area was inspected on 19 March 2018.

In addition to guidelines provided by the NHRA, a set of criteria based on Deacon (nd) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator). These are included in Appendix C-3.

Palaeontological Assessment

John Almond from Natura Viva was appointed to undertake a desktop palaeontological assessment. Refer to Appendix C-4 for the report completed.

The proposed railway project is located in an area that is underlain by potentially fossiliferous sedimentary rocks of Precambrian and younger, Late Tertiary or Quaternary, age. The proposed development will entail excavations into the superficial sediment cover and locally into the underlying bedrock as well. Potentially this development might adversely affect potential fossil heritage within the study area by destroying, disturbing or permanently sealing-in fossils at or beneath the surface of the ground that are then no longer available for scientific research or other public good.

This potentially fossiliferous rock units (groups, formations etc.) represented within the study area were determined from geological maps and satellite images. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience (Almond & Pether, 2008). This data is then used to assess the palaeontological sensitivity of each rock unit to development. The likely impact significance of the proposed development on local fossil heritage is then determined on the basis of the:

- Palaeontological sensitivity of the rock units concerned; and
- Nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged.

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a Phase 1 field assessment study by a professional palaeontologist is usually warranted to identify any palaeontological hotspots and make recommendations for any monitoring or mitigation required before or during the construction phase.

On the basis of the desktop and Phase 1 field assessment studies, the likely impact of the proposed development on local fossil heritage and any need for specialist mitigation are determined. Adverse palaeontological impacts normally occur during the construction rather than the operational or decommissioning phase. Phase 2 mitigation by a professional palaeontologist – normally involving the recording and sampling of fossil material and associated geological information (e.g. sedimentological data) may be required

- In the pre-construction phase where important fossils are already exposed at or near the land surface; and / or
- During the construction phase when fresh fossiliferous bedrock has been exposed by excavations.

To carry out mitigation, the palaeontologist involved will need to apply for palaeontological collection permits from the relevant heritage management authorities, i.e. the SAHRA. It should be emphasized that, providing appropriate mitigation is carried out, the majority of developments involving bedrock excavation can make a positive contribution to our understanding of local palaeontological heritage.

The information used to compile the Desktop Palaeontological Assessment was based on the following:

- A review of the relevant satellite images, topographical maps and scientific literature, including published geological maps and accompanying sheet explanations, as well as a previous desktop and field-based palaeontological assessment studies featuring comparable bedrocks in the Kathu - Sishen region (e.g. Almond 2010, 2013, 2014, 2015a, 2015b, Pether 2011).
- The author's previous field experience with the formations concerned and their palaeontological heritage (Almond & Pether, 2008).

Environmental Management Programme

A Draft EMPr is included as part of the Draft BAR. The EMPr outlines the impacts and mitigation measures for the construction, operation and maintenance and decommissioning phases of the project. More specifically, the EMPr, as per Appendix 4 of the EIA Regulations (2014) as amended, the following is included:

- Summary of Impacts: this summary includes the predicted negative environmental impacts for which mitigation is required and positive impacts requiring enhancement.
- Description of mitigation measures: the EMPr identifies feasible and cost-effective mitigation measures to reduce the significance of negative impacts to acceptable and legal levels. Mitigation measures are described in detail and are accompanied by designs, equipment descriptions and operating procedures, where appropriate, as well as descriptions of technical aspects for implementing the mitigation measures.
- Description of monitoring programme: the monitoring programme indicates the linkages between impacts, indicators to be measured, measurement methods and definition of thresholds that will signal the need for corrective actions.
- Emergency Action Plan: the identification of possible accidents during the construction and operation phase of the project, with measures on how they will be prevented and/or managed.
- Institutional arrangements: these arrangements depict and define the responsibilities for mitigation and monitoring actions.
- Legal enforceability: the contents of the EMPr are legally enforceable.
- Implementation schedule and reporting procedures that specify the timing, frequency and duration of the mitigation measures. It includes the requirements for record keeping, reporting, review, auditing and updating the EMPr.

Public Participation Process

The PPP is an integral requirement of the NEMA. AECOM has undertaken the PPP for the proposed project in accordance with the requirements of Chapter 6 of the EIA Regulations (2014).

The purpose of the PPP is to inform I&APs about the BA process required for the proposed project.

Objectives and approach

The main objectives of the PPP are to:

- Inform I&APs of the proposed project, and provide sufficient background and technical information regarding the project;
- Establish communication channels and feedback mechanisms that enable I&APs to participate meaningfully in the BA process, and raise their concerns, issues and opinions; and

- Assist in identifying potential impacts associated with the proposed project, based on local knowledge.

The PPP thus ensures that I&APs' views are communicated to and considered by the Applicant. The approach to any PPP depends on the details of the project, and the process is structured accordingly to these details. Where possible, and within the required statutory frameworks, the PPP is structured according to the needs of project-specific I&APs. All I&APs are given an equal opportunity to comment and raise issues relating to the impact of the proposed project on the biophysical, social and economic environments.

Identification and Registration of I&APs

Key stakeholders were identified for engagement on issues that have or may transpire during the BA process, as follows:

- Landowners and occupiers of land directly affected by the project;
- Adjacent landowners and occupiers;
- Gamagara Local Municipality;
- Ward Councillor;
- Provincial authorities;
- DWS;
- SAHRA.

A database of I&APs has been compiled (Appendix D), inclusive of individuals, organisations, institutions, communities and the structures that represent them. The focus is on those stakeholders who may influence decisions regarding the project; not all stakeholders are necessarily in the project's direct sphere of influence. As additional stakeholders are identified throughout the BA process, the database will be updated accordingly.

Project Announcement Phase

Advertisements were placed in the main body of the newspapers as given in Table 9. Copies of the newspaper advertisements are provided in Appendix D.

Table 9: Advertisements

Newspaper	Date	Language
1. Diamond Field Ad	19 October 2017	English
2. Noordkaap	25 October 2017	Afrikaans
3. Express Northern Cape	25 October 2017	English
4. Kalahari Bulletin	26 October 2017	English
5. Kathu Gazette	28 October 2017	Afrikaans

Site notices were erected on 21 September 2017 at 6 locations as shown in Table 10. Copies of the site notices are provided in Appendix D.

Table 10: Site notice locations

Site Notice Location	Latitude	Longitude
1. R325 Roadside	27°49'56.82"S	22°58'41.65"E
2. Contracts Management Office	27°51'47.79"S	22°58'16.73"E
3. Security Office	27°51'49.62"S	22°58'16.80"E
4. R325 and N14 Intersection	27°53'20.69"S	22°58'3.77"E
5. N14 Roadside	27°52'15.93"S	22°58'49.69"E
6. Kathu Public Library	27°41'58.55"S	23° 2'59.90"E

A project announcement letter was sent to I&APs on 24 October 2017, this was resent to the updated I&AP database accompanied by a Background Information Document (BID) to notify I&APs of the BA process and invite them to participate in the relevant processes on 08 November 2017. This letter provided:

- A description of the project.
- An outline of the BA process and PPP to be followed.
- An indication of how, when and where stakeholders and I&APs can participate in the PPP.

A copy of the BID is provided in Appendix D.

Public Review of the Draft and Final BAR and EMPr

The Draft BAR and EMPr will be made available to the public and state departments for their comment as well as all registered I&APs. The reports will be made available in the public domain for a period of 30-calendar days, as per the EIA Regulations (2014) as amended. The review period would be scheduled for 26 April 2018 to 30 May 2018. Upon completion of the review period, the project team will update their reports to incorporate and/or address comments received. Hard copies of the report will be made available at the following locations:

Table 11: Locations for the review of Draft BAR and EMPr

Location	Address	Contact Details
1. Assmang: Security Office	Khumani Mine, off N14, south of Kathu	(053) 723 8653 Ashley Engelbrecht
2. Kathu Public Library	Cnr Frikkie Meyer and Hendrik Van Eck, Civic Centre, Kathu	(053) 723 2060

The Final BAR and EMPr will be presented to the DEA. If there are any additional comments subsequent to the public review period of the Draft BAR and EMPr, the public provides these directly to the authorities. This fulfils the requirement that the decision-makers and the public work from the same information set.

Electronic copies of the report will also be made available to stakeholders on request.

Notification of Environmental Authorisation

Once the competent authority has reached a decision regarding EA, I&APs registered on the database would be notified of the decision within 14 (fourteen) calendar days. The full EA document would be made available. The public will also be informed of its right to appeal the decision and the process to follow. Should anyone wish to appeal, a notice of intension to appeal must be lodged with the Minister within 20 days of the date of the EA.

7. Description of the Affected Environment

Note: the sub-sections set out in the section below should be read in conjunction with the specialist reports enclosed herewith as Appendix C.

Climate

The Gamagara Local Municipality has typical arid climatic circumstances generally found in the Kalahari region, with temperatures ranging between 8°C and 28°C. The rainfall varies between 350 mm and 500 mm per annum, which is below the generally accepted average needed for dry land cropping. (Gamgara Integrated Development Plan, 2016-2017)

Geology and Soils

The landscape of the Gamagara Local Municipality may be seen as relatively flat, with a series of dry bedded rivers crossing the area. Mountainous areas do however occur in some parts of the municipal area. The geologically groups found in the municipal area are the Griquatown, Kalahari and Olifantshoek group. (Gamgara Integrated Development Plan, 2016-2017).

According to the land type database the development falls within the Ae12 and Ag110 land types (Figure 5). The soils can be described as red-yellow apedal, freely drained soils with a high base status (< 300mm deep).

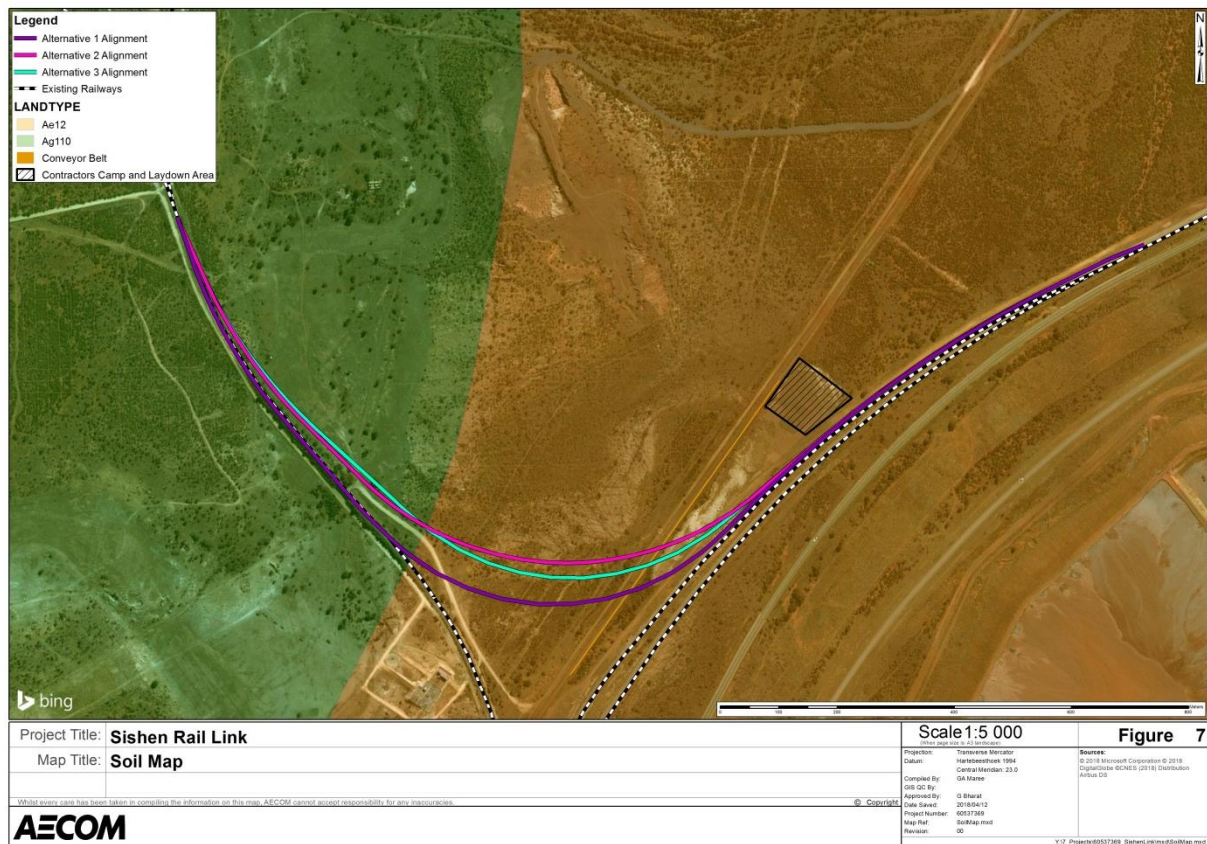


Figure 5: Soils Map

Wetlands

The project area is situated in the quaternary catchments D41J, within the Vaal Management Area (WMA 5).

Soil Form was the key wetland indicator as described by the DWAF (2005) guidelines that was implemented for the study. Limited wetland vegetation was identified on site, and the dry season conditions inhibited the use of vegetation as an effective wetland indicator. Limited signs of wetness in the soil profile were identified within the top 50cm of the soil surface within the project area, thus Soil Form was considered the key wetland indicator. The topography of the area was used to support the delineation of the wetland areas.

The wetland delineation is shown in Figure 6 with the wetland classification as per SANBI guidelines (Ollis *et al.*, 2013) in Table 12. One (1) HGM type was identified within the 500m project assessment boundaries, namely an unchannelled valley bottom wetland. The valley bottom wetland is associated with the Gamagara River, and photographs of the system further downstream of the project area are presented in Figure 7.

Table 12: Wetland Classification as per SANBI Guideline (Ollis *et al.*, 2013)

Unit	Level 1		Level 2	Level 3	Level 4	
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B 4C
HGM 1	Inland	Southern Kalahari	Eastern Kalahari Bushveld Group 1	Valley Floor	Unchannelled Valley Bottom	N/A N/A

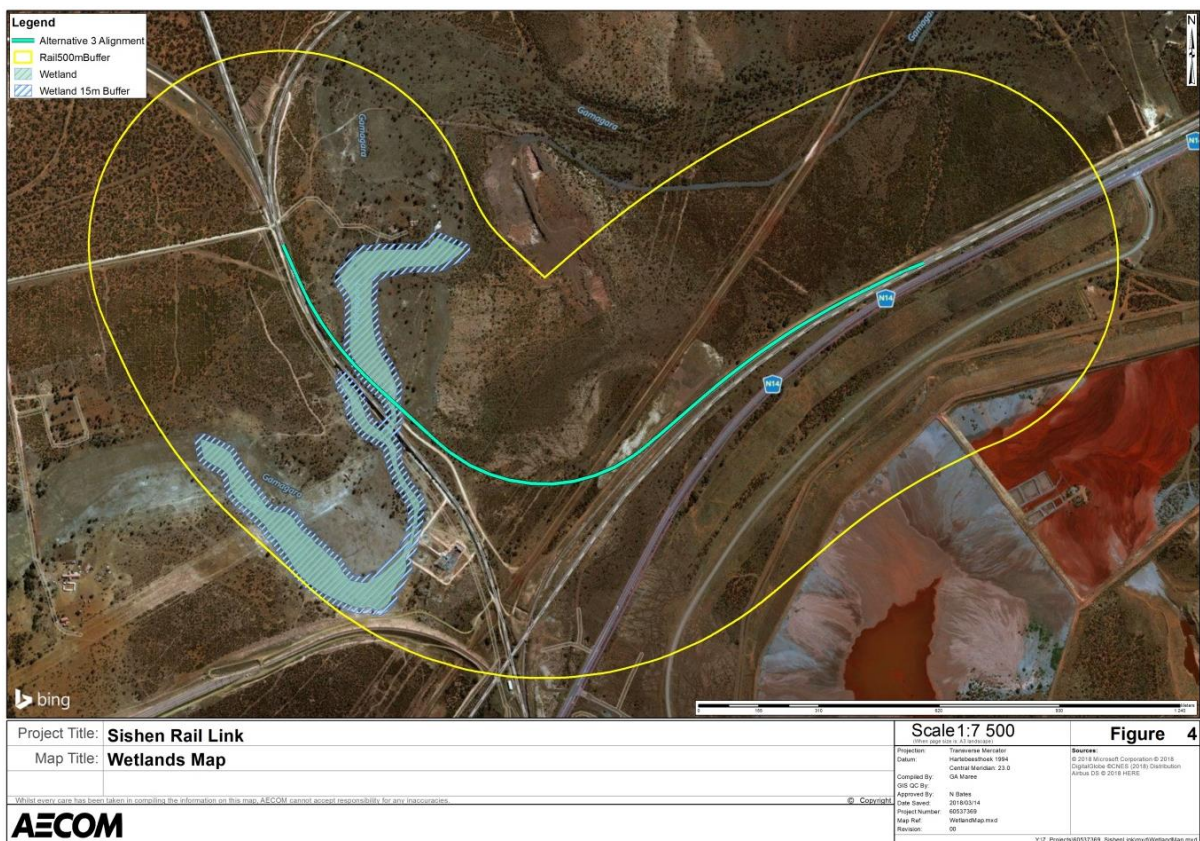


Figure 6: Wetland delineation showing HGM1



Figure 7: Photographs of the Gamagara River downstream of the project area

The PES results are described in the sections below with Table 13 showing the combined results. The health of the HGM unit was determined to be moderately modified. A summary of aspects that have impacted on the wetland systems is discussed below.

The hydrology of the valley bottom wetland was determined to be moderately modified (Rating: C). The developments within the catchment area, which includes mining infrastructure, railways and roads (including bridges) have altered the surface flow dynamics.

The impact of the modifications on the hydrological integrity is identifiable. The size of catchment areas has been reduced due to these developments, and flows have also been obstructed or impeded. Due to the non-perennial characteristics of the Gamagara River, modifications to the hydrology of the system are determined to be moderate.

Due to general development of the project area, consisting of roads and servitudes, railways and also the local agricultural and mining activities, the geomorphology of the wetland units is largely modified. Modifications include excavations within the system, subsidence in selected area and also the system being traversed by access routes. The system has also been narrowed in selected reaches due to the development into and across the wetland, concentrating flows through narrow crossing areas.

The status of the vegetation associated with the valley bottom wetland was determined to be moderately modified. Similarly, to the above-mentioned impacts, the development of the area and the local agricultural activities, notably grazing have impacted on the vegetation. The vegetation composition associated with the systems has been moderately altered but introduced alien and/or ruderal species are still clearly less abundant than characteristic indigenous wetland species (Macfarlane *et al.* 2007).

Table 13: PES Score for the wetland system in the project area

Unit	Area	Hydrology		Geomorphology		Vegetation	
		Rating	Score	Rating	Score	Rating	Score
HGM 1	9.1	C: Moderately Modified	3.2	D: Largely Modified	4.9	C: Moderately Modified	3.1
Overall PES Score		3.7		Overall PES Score		C: Moderately Modified	

The EIS assessment was applied to the HGM unit 1 to assess the levels of sensitivity and ecological importance of the wetland. The EIS for HGM 1 was determined to be High (Class B) based on the high levels of service for sediment trapping and phosphate and toxicant assimilation. The Hydrological Importance of HGM 1 was determined to be Moderate (Class C). The Direct Human benefit for HGM 1 was determined to be Low.

Buffer zones were suggested for the HGM type to address the vulnerability of the systems to impacts. All of the risks were reduced to either Low or Very Low, on the assumption that the recommended mitigation measures would be implemented. The buffer zone is not likely to be applicable to the railway line, but to supporting aspects

such as access area, laydown yards and storage areas for example. A buffer zone of 15m that must be avoided was prescribed for the construction and operational phases of development. Refer to Figure 1.

The rail alignment traverses the wetland area over approximately 118m in length and inclusive of the buffer zone, to 202m.

Biodiversity and Ecology

Northern Cape Critical Biodiversity Areas Map

The proposed Sishen rail link site is situated across an Ecological Support Area (ESA) and an Other Natural Area (ONA), as shown in Figure 8. Much of the surrounding project areas are not classified due to extensive development and the presence of roads and other man-made infrastructure which has completely altered the original natural habitat.

The ONA's are areas that are usually not in pristine condition and do not necessarily support high levels of biodiversity. The project area does however only marginally enter the ESA and it is only certain portions of the development that enter this habitat. Specifically, it is the western portion of the railway extension that enters this ESA. This area is most likely classified as an ESA due to the presence of the seasonal Gamagara River and wetland to the west of the project site.

The project area is situated in an environment which is rated as Not Protected and Least Threatened (LT) in terms of the National Biodiversity Assessment (Driver *et al.*, 2012).

Protected Areas

The formally protected Marakele National Park is situated approximately 186 km south-east of the project area whereas Witsand Nature Reserve is located approximately 101 km south-west of the project area (Figure 9).

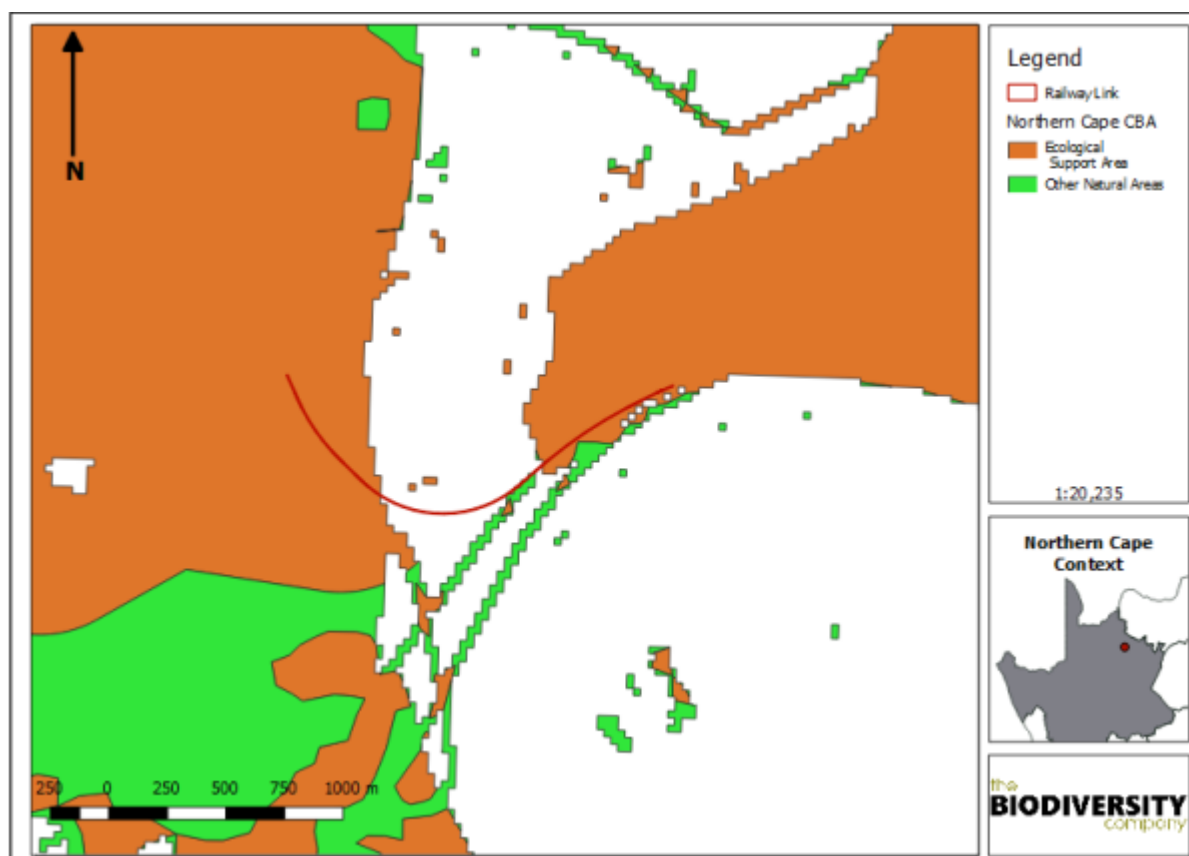


Figure 8: Critical Biodiversity Areas and Ecological Support Areas (BGIS, 2017)

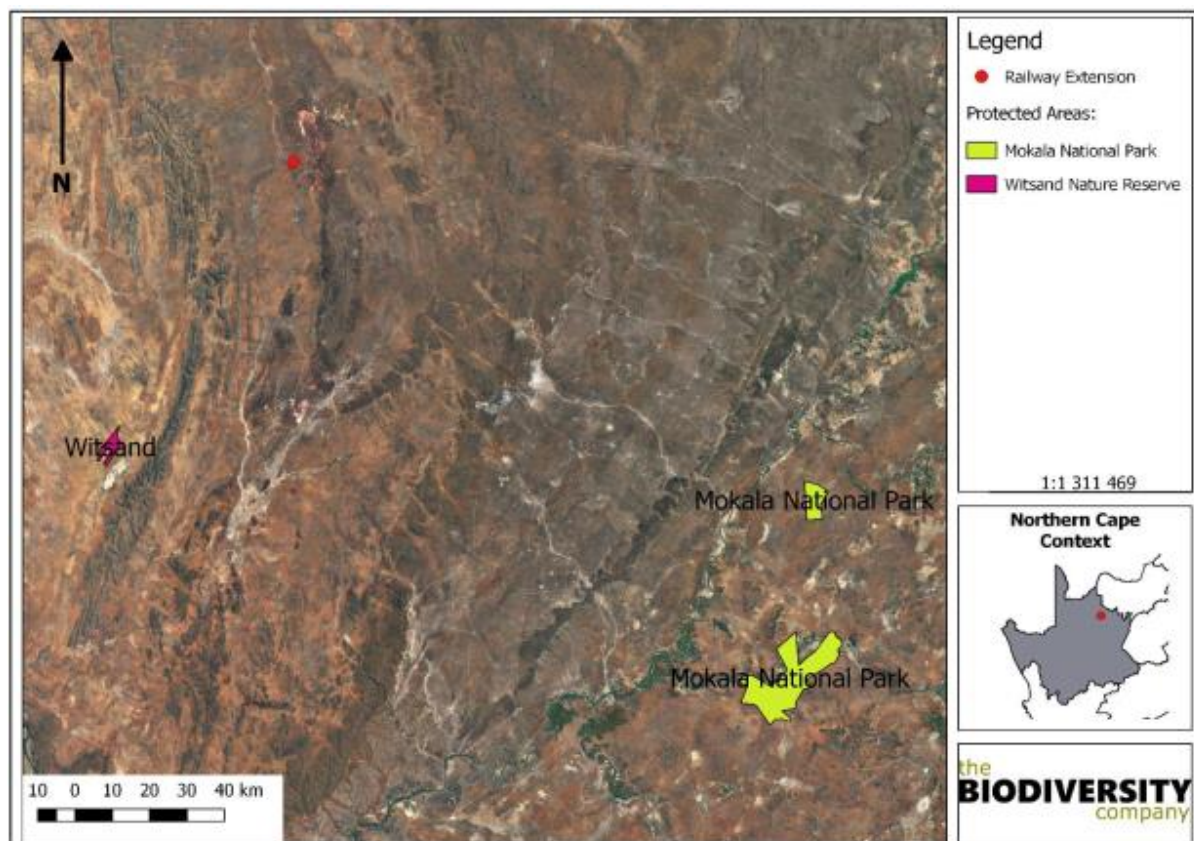


Figure 9: Formally protected areas in relation to the project area (BGIS, 2017)

Vegetation

The site is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include Seasonal precipitation, and (sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006). Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include Acacia and Albizia) and a generally dense herbaceous layer (Scholes & Walker, 1993).

The Savanna biome comprises many different vegetation types. The project area spans two different vegetations types according to Mucina & Rutherford (2006), namely the Kathu Bushveld vegetation type and the Kuruman Thornveld vegetation type (Figure 10).

The Kathu Bushveld vegetation type (yellow area in Figure 10) is found throughout the Northern Cape Province, typically in the open plains from Kathu and Dibeng in the south, through Hotazel, and up to the Botswana border in the north. This vegetation type typically comprises of a medium-tall tree layer with *Vachellia erioloba* dominant in places, but mostly open and including *Boscia albitrunca* as the prominent trees.

The Kuruman Thornveld vegetation type (green area in Figure 10) occurs in the North-West and Northern Cape Provinces. It typically occurs on the flats from the vicinity of Postmasburg and Danielskuil (west of the Kuruman Hills) in the south extending via Kuruman to Tsineng and Dewar in the north, usually at altitudes between 1 100–1 500 m above sea level.

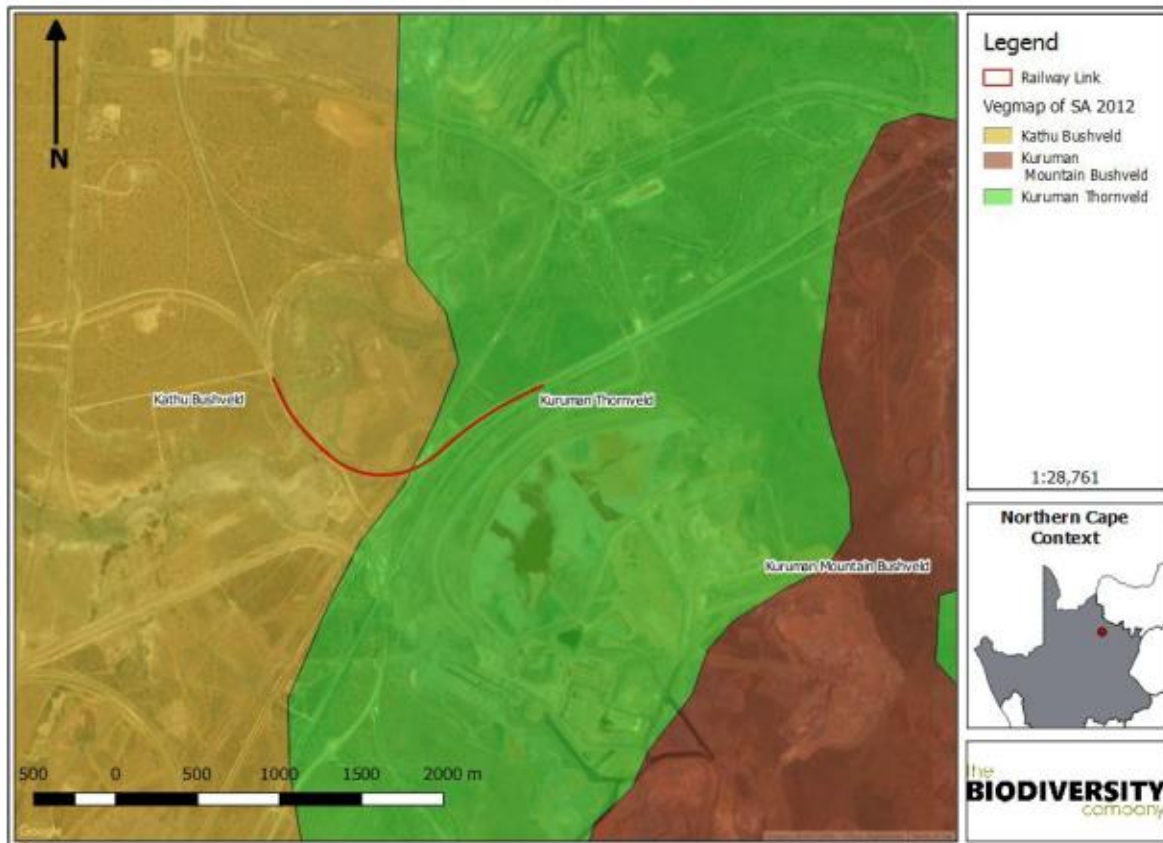


Figure 10: Vegetation types based on the Vegetation Map of South Africa, Lesotho and Swaziland (BGIS, 2017)

Two distinct areas were noted during the field survey (Figure 11). The dominant rocky ridge along the northern extent of the site was characterised by numerous large boulders and exposed rock. The other distinct habitat type was the lower lying area to the south which was less undulating than the ridge area and the vegetation consisted of predominantly grass species. This second area also appeared to have been previously disturbed land and was in closer proximity to the existing railway infrastructure. Highly transformed areas, such as the access road and areas adjacent to the existing conveyor belt and railway sidings were excluded from fauna and flora surveys. Surveys were done in those areas where the lowest amount of existing disturbance was observed in relation to all the areas where the railway extension was proposed.



Figure 11: Distinct areas identified during the field survey

The rocky ridge area was dominated by low stands of small bushes, mostly *Senegalia mellifera* (Blackthorn). The lower lying area was dominated by grass species and a few clumps of *Ziziphus mucronata*. This area can be considered modified to a small extent, but the ground layer was sufficiently covered by mostly indigenous plants. Figure 12 shows the difference in vegetation structure and topography between the two areas.

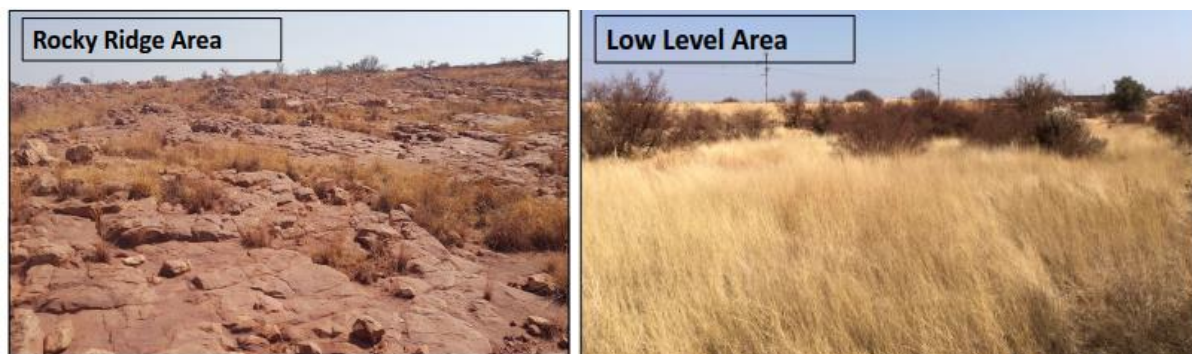


Figure 12: Vegetation components of the project site showing the veld condition along the rocky ridge in the northerly section and the lower lying veld in the south

Importantly, in the lower lying area two protected tree species were observed, namely *Vachellia erioloba* (Camel Thorn) and *Boscia albitrunca* (Shepherd Tree). Both these tree species are protected by law and if any of the planned development, or any other future development may infringe on the abovementioned, an application for a permit of removal or translocation will be necessary as governed by Section 15(1) of the National Forests Act, 1998 (Act No. 84 of 1998). Six (6) individual trees from the list of protected tree species were observed during the field study (Figure 13). The importance and sensitivity of the plant communities in the project area was rated as moderate, due to the plant species of conservation of concern being recorded in the area.

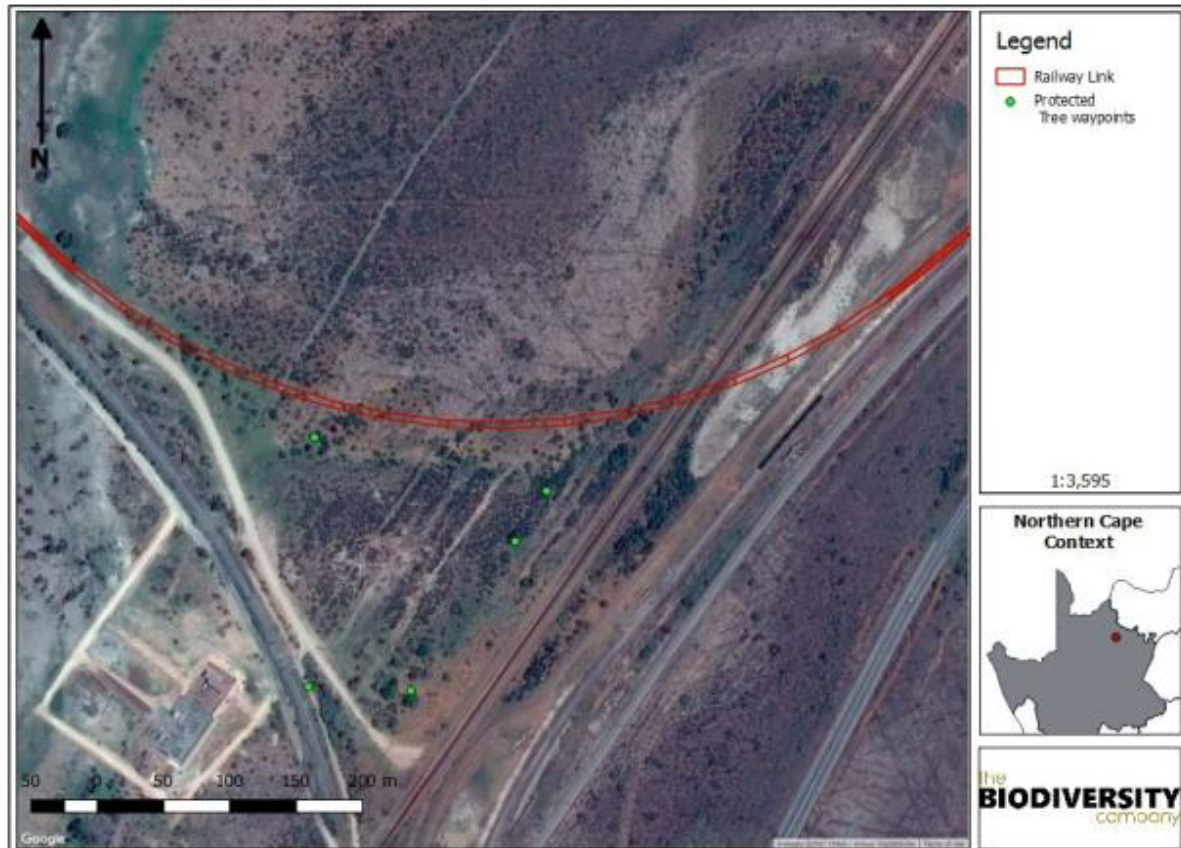


Figure 13: Location of protected tree species within the study area

Alien Invasive Plant Species

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

One Category 1b species¹ was recorded at the site and must therefore be removed by implementing an alien invasive plant management programme in compliance of section 75 of the NEM:BA as stated above. The identified species was *Opuntia ficus-indica* (Figure 14).

¹ The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) explains that a Category 1b species is an invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.



Figure 14: An example of *Opuntia ficus-indica* identified at the project site, a category 1b alien invasive plant species

Avifauna

Based on the South African Bird Atlas Project (SABAP, Version 2) 157 bird species are expected to occur in the general study area and of the expected bird species, four (4) are listed as Species of Conservation Concern (SCC) either on a regional or global scale.

The expected bird SCC are discussed below.

- *Aquila verreauxii* (Verreaux's Eagle) is listed as vulnerable (VU) on a regional scale and least concern (LC) on a global scale. This species is locally persecuted in southern Africa where it coincides with livestock farms, but because the species does not take carrion, is little threatened by poisoned carcasses. Where hyraxes are hunted for food and skins, eagle populations have declined (International Union for Conservation of Nature, IUCN, 2017). Based on the expected habitat and the availability of prey items, especially an abundance of hyraxes) the likelihood of occurrence of this species is rated as moderate.
- *Ardeotis kori* (Kori Bustard) is listed as NT both on a regional and global scale. It occurs in flat, arid, mostly open country such as grassland, karoo, bushveld, thornveld, scrubland and savanna but also including modified habitats such as wheat fields and firebreaks. Collisions with high voltage power lines are a major threat to this species in the Karoo of South Africa (IUCN, 2007). The habitat at the project site, specifically the rocky ridge, is not the typical habitat of this species and therefore its likelihood of occurrence is rated as low.
- *Cursorius rufus* (Burchell's Courser) is listed as VU regionally and as LC on a global scale. This species utilises an array of habitat types, even degraded areas. Burchell's Courser is threatened by habitat degradation as a result of poor grazing practices and agricultural intensification, as well as by disturbance from domestic livestock. The likelihood of occurrence for this species at the project site is medium to low.
- *Gyps africanus* (White-backed Vulture) has a large range and only occurs throughout sub-Saharan Africa. Primarily a lowland species of open wooded savanna, particularly areas of Acacia (*Vachellia*). It requires tall trees for nesting. According to the IUCN (2017) this species faces similar threats to other African vultures, being susceptible to habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning. Due to the development near the project area individuals may be seen foraging within the area but are unlikely to be resident.

Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 59 mammal species that could be expected to occur within the project area. Of these species, 7 are medium to large conservation dependant species, such *Ceratotherium simum* (Southern White Rhinoceros), *Syncerus caffer* (African Buffalo) and *Tragelaphus oryx* (Common Eland) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area. Of the remaining 52 small to medium sized mammal species, eight (8) are listed as being of conservation concern on a regional or global basis.

The expected mammal SCC are discussed below.

- *Aonyx capensis* (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic and it is seldom found far from water. Based on the absence of permanently flowing or natural open water bodies in the project area, the likelihood of occurrence of this species occurring in the project area is considered to be very low.
- *Atelerix frontalis* (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Although the species is cryptic and therefore not often seen, there is suitable habitat in the project area and therefore the likelihood of occurrence of this species in the project area is considered to be moderate.
- *Felis nigripes* (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the arid central Karoo region of South Africa, the habitat in the project area can be considered to be good; the likelihood of occurrence is moderate.
- *Panthera pardus* (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low and the likelihood of occurrence in an area with relatively high human density, such as the project area, can be regarded as low.
- *Parahyaena brunnea* (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the project area is moderate to good. The presence of moderate to large herbivores on adjacent farms increases the likelihood of occurrence of this species.
- *Poecilogale albinucha* (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wide habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas where it does occur. There is sufficient habitat for this species in the project area and the likelihood of occurrence of this species is therefore considered to be moderate.
- *Rhinolophus denti* (Dent's Horseshoe Bat) is listed as NT regionally and is typically associated with savanna habitats. Populations are largely dependent on caves, abandoned mines and similar habitats for roosting (IUCN, 2007). Due to the lack of such habitat at the project site, the likelihood of occurrence is low.
- *Smutsia temminckii* (Temminck's Ground Pangolin) is a predominantly solitary, terrestrial species that inhabits mainly savanna woodland in low-lying regions with moderate to dense scrub where average annual rainfall is between 250 mm and 1,400 mm (IUCN, 2017). The species is eaten as bushmeat to various extents across its range (e.g. South Africa, Zimbabwe, Namibia, Mozambique, Tanzania). Of greater threat is overexploitation for body parts and scales which have superstitious value and are used for medicinal purposes (IUCN, 2017). The likelihood of occurrence of this species in the project area is low due the fact that the adjacent infrastructure (e.g. railway line) and associated disturbance would typically force sensitive species such as this to other areas.

Herpetofauna (Reptiles and Amphibians)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2017) 36 reptile species are expected to occur in the project area. No species of conservation concern should be present according to the above-mentioned sources. Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2017) 11 amphibian species are expected to occur in the project area. No species of conservation concern should be present according to the above-mentioned sources within the project area.

Socio-economic Environment

According to the (Gamagara Draft Integrated Development Plan, 2017-2022), the Gamagara Local Municipality has become a significant player in the Northern Cape Province and an important contributor to South Africa's mining sector, and international mining value chain, thus, making it a centre of concentration for providing relevant and up to date infrastructure to accommodate such development. The Gamagara Local Municipality will benefit from infrastructure investments which will drive and initiatives that have to characterize the town's economic development trajectory. The municipality has identify the economic pull and push factors, such as education and training, research, entrepreneurship, community image and the arts.

The Gamagara Local Municipality has planned to develop into a commercial and industrial town over and above the mining economic spin-offs. It has a potential to develop into an industrial city by 2030 and a manufacturing city by 2060. The Northern Cape-Saldanah Bay railway line as a national development corridor also present the municipality with the opportunity to economically growth. Exploiting the benefits and spinoffs that could be derived from the N14 road to Namibia could also contribute to the growth of the municipal economy.

Statistics of South Africa Community survey 2016 indicates that the Gamagara Local Municipality has a total population of 53 656 as compared to 41,617 in 2011. Thus translating to a population increase of 33.4% (12,039 individuals) from 2011 to 2016. Population is growing at a rate of 6.68% per year. Population density (people per square kilometre) increased from 8.9 to 15.9. The Gamagara Local Municipality has a high urbanisation rate of 97.6%, which is significantly higher than that of the District (24.9%).

Gamagara Municipality composition is characterised by African, Coloured, Whites and Indian or Asian people. Population is comprised of 48, 6% African, 32, 6% Coloured, 18% Whites and 0, 82 % Indian/Asian (Figure 15). Gender ratio was recorded at 120,1:100 male to females and mean age was 27 years as captured in census 2011 (Statssa, 2011).

The literacy level is low and only 24, 9 % have gone through matric and 3, 6% has through higher education. The most significant portion of Gamagara's population is resident in Kathu (27.7% or 11,511 individuals), followed by Sesheng (26.5% or 11,033 individuals), Olifantshoek (24.6% or 10,235 individuals), and Dibeng (18.9% or 7,848 individuals). Another 2.4% (991 individuals) of the Municipality's population is resident in the Gamagara Non-Urban (NU) 8 area.

In terms of population growth, all the main places experienced a positive growth from 2001 to 2011 except the Gamagara NU mail place. Sesheng and Dibeng experienced the most significant growth rate of 125.7% and 95.9% respectively. In terms of numbers the main place that experienced the most significant growth is Sishen (6,144 individuals) and Kathu (5,232 individuals). The Gamagara NU area covers 89.6% of the Gamagara Municipality's total geographical area. The second largest geographical area and largest urban area is Sishen, which covers 6.9% of the Municipality.

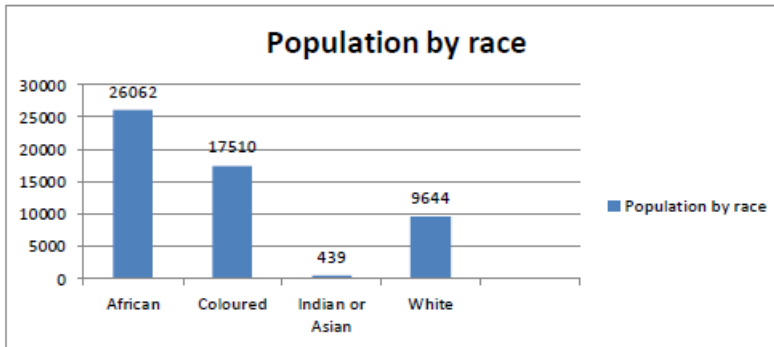


Figure 15: Population by race in the Gamagara Local Municipality

The majority of employed people in the municipal jurisdiction are male, while female are the most unemployed and discouraged work-seekers. Females also constitute a large number of those that are not economically active. This analysis indicates that most of the job creation initiatives should be targeted at females. 17, 7% of the population of Gamagara were not employed and 65% of those constitute youth (Figure 16).

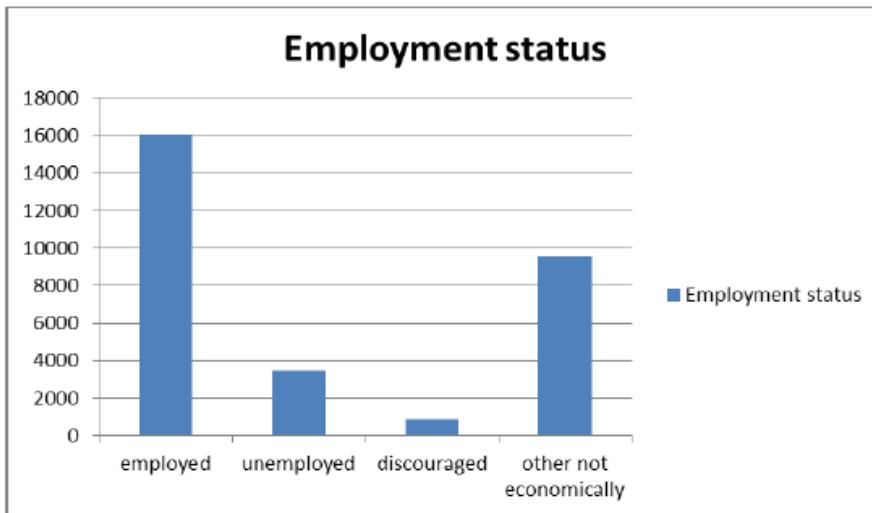


Figure 16: Employment status

Heritage Resources

Based on the desktop assessment, it was expected that archaeological traces might occur in the sets of circumstances, as shown in Table 14. Following the site investigation, it was found that the vicinity of the proposed railway development lacked many of the aspects or features that might point to potentially significant archaeological sites being present. However, the rock ridge and exposed bedrock was carefully scanned to evidence of rock engravings. On the whole it was found that the development site has generally low surface density of isolated Stone Age artefacts, probably mainly of Pleistocene age (though often difficult to type definitively), of low archaeological integrity (e.g. lithics only, lacking context and potential for dating), and hence of limited significance. Notable observations made on 19 March 2018 are tabulated below.

Table 14: Observational Traces of Archaeological Artefacts

Expected Circumstances on Desktop Assessment	Confirmation during Site Investigation
Landscape settings in which dolines occur might yield archaeological sites similar to those documented in the case of Kathu Pan.	No dolines were observed and no hint of sites similar to those at Kathu Pan was found.
Rich raw material sources outcropping locally might be foci for 'workshop' knapping sites such as Kathu Townlands.	There were no rich preferred raw material sources (e.g. jaspilite) outcropping locally and no sense of concentrated knapping was evident (many of the artefacts found were however on jaspilite and represent instances of stone tools carried in – whether by humans or [to some extent] natural

Expected Circumstances on Desktop Assessment

Confirmation during Site Investigation

	secondary depositional processes).
Riverside settings might support higher density site/artefact occurrences because of the affordances of proximity to water and river-side ecologies.	The development site lies upslope from the course of the Gamogara River and this proximity may in part account for the occurrence of such artefacts as were observed.
Exposure of bedrock in the form of boulders or smooth sheets of rock may support rock art in the form of engravings.	The rocky ridge and outcrops presented some potential for rock art – but none was found. Nor was it of a nature that provided any particular shelter.
Topographic features such as hills or rocky ridges may provide shelters with traces of precolonial Stone Age occupation/activity.	
Iron Age traces including pottery are known from ridges in the wider landscape as well as from sandy plains.	No ceramics were found or any stone-walled feature suggestive of Iron Age occupation.

Examples of archaeological resources found within the study area (specifically the rocky ridge area) are shown in Figure 17. All resources were noted as low significance and their locations are shown in Figure 18.



Figure 17: Examples of low significance archaeological artefacts within study area

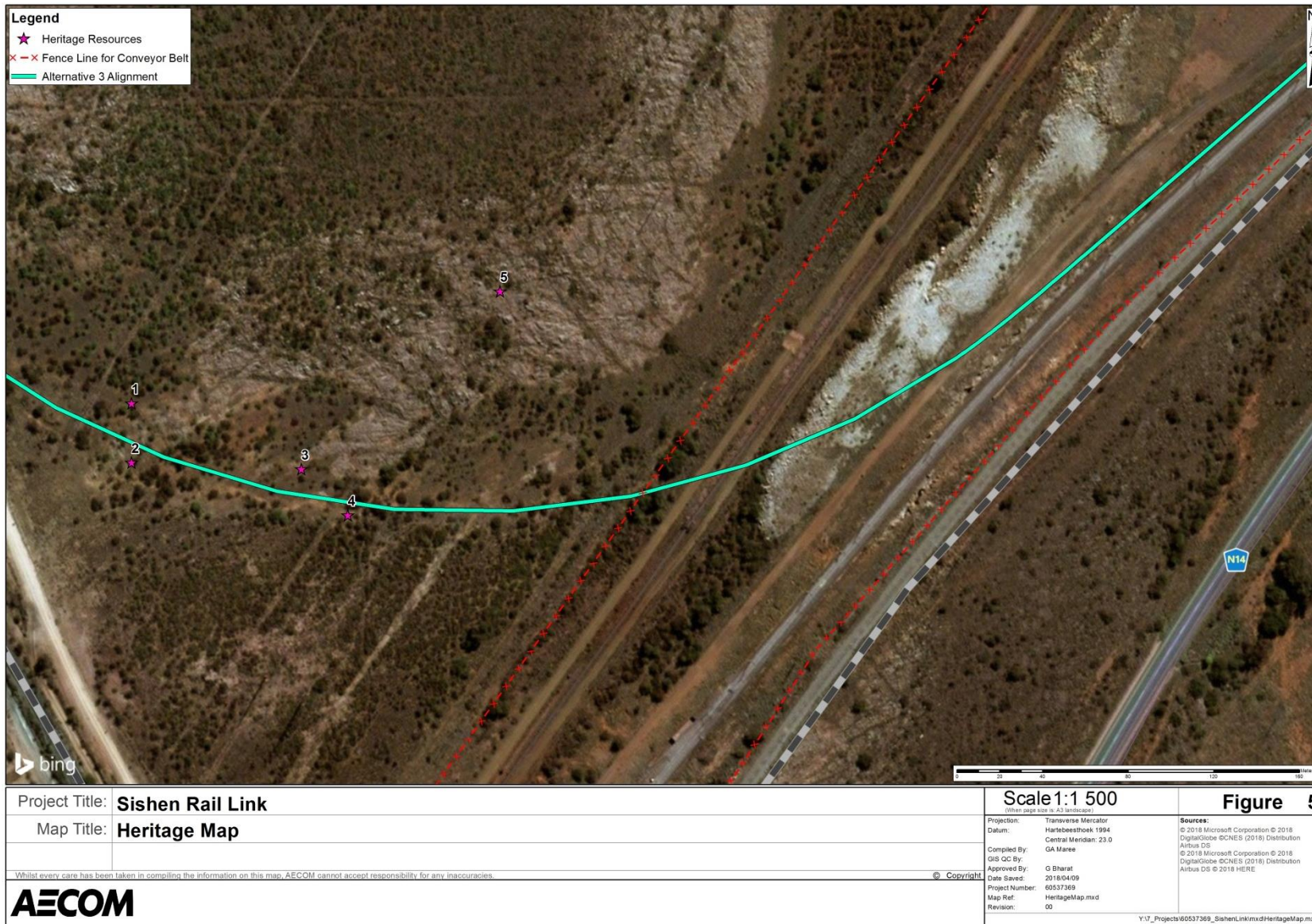


Figure 18: Heritage Map

Palaeontological Resources

The Precambrian bedrocks underlying the railway project area comprise terrestrial or submarine lavas (Ongeluk Formation, Postmasburg Group) as well as iron formation (Gamagara Formation, Elim Group) of Neoproterozoic age (c. 2 billion years old) that are completely unfossiliferous. The overlying thick Late Caenozoic superficial deposits – including calcretes, surface gravels and aeolian sands of the Kalahari Group – are, at most, sparsely fossiliferous and to a considerable extent already disturbed by mining-related activity. Low-diversity assemblages of trace fossils as well as non-marine molluscs (e.g. snails) and rare vertebrate remains (e.g. teeth, bones and horn cores of mammals) might occur within consolidated alluvial deposits along the Gamagara wetland area that is crossed by the proposed new rail link. Important Pleistocene vertebrate and Stone Age archaeological remains are recorded from calcrete solution hollows at Kathu Pan, for example, less than 20 km north of the present study area. With the notable exception of the vertebrate remains, these Late Caenozoic fossils probably occur widely across the Kalahari region of the Northern Cape and are not considered to be of high conservation value.

The fauna mainly consists of delicate, fragmentary tooth material (caps or shells or dental enamel) but also include some bones with at least one almost intact ungulate skeleton (Figure 19). Most teeth and associated artefacts are covered with a distinctive shiny silicate patina. The fossils are assigned to the Cornelian Mammal Age (c. 1.6 Ma to 500 ka) and Florisian Mammal Age (c. 200 to 12 ka) that are associated with Acheulean and MSA stone artefact assemblages respectively (Klein 1984, 1988, Beaumont *et al.* 1984, Beaumont 1990, Beaumont 2004, Porat *et al.* 2010 and refs. therein; see also MacRae 1999). Interesting Cornelian mammal taxa found here include the extinct *Elephas recki* and *Hippopotamus gorgops* as well as various equids, white rhino and hartebeest / wildebeest-sized alcephalines. The dominance of grazers over browsers or mixed feeders among the Middle Pleistocene mammalian fauna suggests that the vegetation was grassy savannah at the time. Higher up in the succession the remains of typical Florisian forms such as *Pelorovis antiquus* the Giant Buffalo, *Megalotragus priscus* the Giant Hartebeest and *Equus capensis* the giant Cape Horse also occur (Figure 20).

Many of the tooth fragments as well as the associated MSA stone artefacts in this younger horizon are abraded, suggesting fluvial reworking of material into the doline together with the gravelly sand matrix. Additional fossil material of biostratigraphic and palaeoecological interest from the Kathu Pan doline infills include fossil pollens from well-developed peat horizons (Scott 2000), bird fossils, ostrich egg shell fragments and terrestrial gastropods. The mammalian remains may belong to animals attracted to permanent waterholes (e.g. spring eyes), especially during drier phases of the Pleistocene Epoch. The close association of large mammal fossils with abundant stone tools as well as occasional evidence for butchering suggests that human hunters or scavengers may also have played a role as concentration agents.

It is possible that solution cavities within calcretised alluvial sediments associated with the Gamagara drainage line south of Sishen might also contain important fossil vertebrate and Stone Age archaeological remains. The sector of the proposed rail link that crosses the Gamagara Wetland Area (Figure 6) is therefore potentially sensitive in palaeontological terms.

The Desktop Palaeontological Assessment (Appendix C-4) undertaken for this project has much more detailed information to refer to.

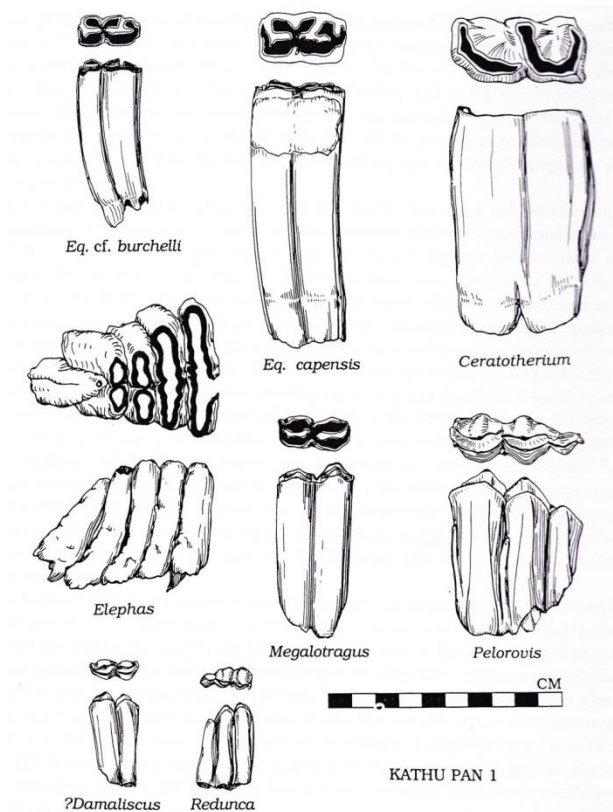


Figure 19: Selection of Pleistocene large mammal teeth collected from solution cavity infills (dolines) at Kathu Pan, Northern Cape (From Klein 1988)

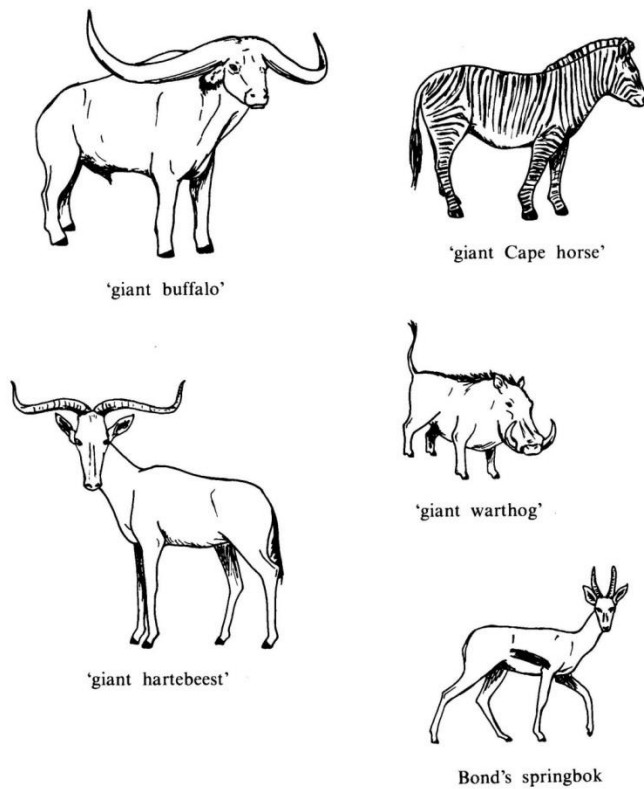


Figure 20: Selection of extinct Pleistocene mammals of the Florisian Mammal Age, most of which are represented at Kathu Pan (From Klein 1984)

Existing Construction Activities

There are no existing construction activities in the area.

Existing Infrastructure

The following existing infrastructure, as shown in Figure 1, is located within 5 km of the railway line:

- Transnet Sishen Substation and associated overhead power lines.
- Conveyor belt that links to the Assmang Khumani Mine.
- Access roads to the substation and the conveyor belts.
- Maintenance / access roads to the existing railway lines.
- Old fence line and farm road which bisects the study area.

8. Environmental Impact Assessment

General

The purpose of this section is to provide an assessment of each of the identified potentially significant impacts and risks associated with the proposed project. A summary of identified impacts per project phase is presented in the sub-sections below.

Design and construction phase

Impacts that may occur during construction include:

- Degradation to air quality;
- Generation of noise;
- Contamination, siltation, erosion, sedimentation and water quality impairment of water resources;
- Increased degradation and fragmentation of vegetation communities;
- Loss of diversity of indigenous faunal communities;
- Soil contamination and erosion;
- Social environment;
- Increased construction vehicle traffic;
- Health and safety;
- Aesthetics management; and
- Damage or loss to archaeological and/or palaeontological resources.

Operational Phase

Impacts during the operational phase of the proposed project are negligible and not significant, for the reason that the construction comprises the linking of already existing infrastructure. The following operational phase impacts were considered:

- Increased noise within the area due to additional trains being used along the Manganese and Ore railway lines;
- Drainage patterns change, storm water management and rail transport on the wetland;
- Continued encroachment and displacement of indigenous vegetation and faunal communities; and
- Invasive alien vegetation due to maintenance activities.

Decommissioning and Closure

There is no intention to decommission or close the infrastructure to be constructed as part of this project. Accordingly, impacts associated with decommissioning and/ or closure have not been considered.

Impact Assessment Methodology

Each issue identified during the Basic Assessment Process consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative from the project onto the environment or from the environment onto the project. The significance of the potential impacts for the study sites will be considered before and after identified mitigation is implemented.

Impact Assessment Criteria

The criteria used for the assessment of the potential impacts of the proposed project are described in Table 15. A detailed impact assessment matrix is provided in Appendix E.

Table 15: Impact Assessment Criteria

Criteria	Description
Nature	Includes a description of what causes the effect, what will be affected and how it will be affected.
Duration	Lifetime of the impact is measured in relation to the lifetime of the project.
Extent	Physical and spatial scale of the impact.
Intensity	Examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment.
Type	Description of the impact as positive, negative or neutral, and direct or indirect.
Consequence	Combination of duration, extent and intensity of impact in relation to the type.
Probability	This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time.
Significance	Synthesis of the characteristics described above and assessed as low, medium or high. Distinction will be made for the significance rating without the implementation of mitigation measures and with the implementation of mitigation measures.

Duration

The lifetime of the impact is measured in relation to the lifetime of the proposed project (Table 16).

Table 16: Description of Duration Criteria

Description	Explanation	Scoring
Short term	Impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than any of the development phases.	1
Short to medium term	Impact will be relevant through to the end of the construction phase.	2
Medium term	Impact will last up to the end of the development phases, where after it will be entirely negated.	3
Long term	Impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.	4
Permanent	The only impact class that is non-transitory. Mitigation by man or natural process will not occur in such a way or time span that the impact can be considered transient.	5

Extent

The physical and spatial scale of the impact is classified below (Table 17).

Table 17: Description of Extent Criteria

Description	Explanation	Scoring
Footprint	Impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
Site	Impact could affect the whole, or a significant portion of the site.	2
Regional	Impact could affect the area around the site including neighbouring farms, transport routes and adjoining towns.	3
National	Impact could have an effect that expands throughout the country (South Africa).	4

International Impact has international ramifications that go beyond the boundaries of South Africa 5

Intensity

The assessment of the intensity of the impact will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project. The intensity will be measured using the criteria listed in Table 18.

Table 18: Description of Intensity Criteria

Description	Explanation	Scoring
Low	Impact alters the affected environment in such a way that the natural processes or functions are not affected.	2
Low-Medium	Impact alters the affected environment in such a way that the natural processes or functions are slightly affected.	4
Medium	Affected environment is altered, but functions and processes continue, albeit in a modified way.	6
Medium-High	Affected environment is altered, and the functions and processes are modified immensely.	8
High	Function or process of the affected environment is disturbed to the extent where the function or process temporarily or permanently ceases.	10

Consequence

Based on the above criteria, the consequence of issues will be determined using the following formula:

$$\text{Consequence} = \text{Type} \times (\text{Duration} + \text{Extent} + \text{Intensity})$$

This is the consequence of the impact is rated as follows (Table 19):

Table 19: Description of Consequence Criteria

Description	Explanation	Scoring
Extreme Detrimental	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts will be irreplaceable and irreversible should adequate mitigation and management measures not be successfully implemented.	-18 to -20
High Detrimental	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects. The impacts may result in the irreversible damage to irreplaceable environmental or social aspects should mitigation measures not be implemented.	-14 to > -17
Moderate Detrimental	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	-10 to -13
Slight Detrimental	A small negative impact. The impact will result in medium to short term effects on the social and/or natural environment.	-6 to -9
Negligible	An acceptable negative/positive impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative/positive medium to short term effects on the social and/or natural environment. The impacts are reversible and will not result in the loss of irreplaceable aspects.	-5 to 5
Slight Beneficial	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	6 to 9

Description	Explanation	Scoring
Moderate Beneficial	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	10 to 13
High Beneficial	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	14 to 17
Extreme Beneficial	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	18 to 20

Probability

Probability describes the likelihood of the impact(s) occurring for any length of time during the lifecycle of the activity, and not at any given time. Table 20 shows the classes.

Table 20: Description of Probability Criteria

Description	Explanation	Scoring
Improbable	Possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is thus zero (0%).	1
Possible	Possibility of the impact occurring is very low, either due to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.	2
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.	3
Highly likely	It is most likely that the impacts will occur at some stage of the Development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.	4
Definite	Impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied upon. The chance of this impact occurring is defined as 100%.	5

Confidence

The level of knowledge or information that the EAP or a specialist had in their judgement is rated as shown in Table 21. Note that this criterion is not given a numerical value.

Table 21: Description of Confidence Criteria

Criteria	Description
Low	Judgement is based on intuition and not on knowledge or information.
Medium	Judgement is based on common sense and general knowledge.
High	Judgement is based on scientific and/or proven information.

Reversibility

Reversibility is the ability of the affected environment to recover from the impact, with or without mitigation (Table 22). Note that this criterion is not given a numerical value.

Table 22: Description of Reversibility Criteria

Criteria	Description
Yes	The affected environment will be able to recover from the impact.

No The affected environment will be unable to recover from the impact that is permanently modified.

Replaceability

Replaceability is an indication of the scarcity of the specific set of parameters that make up the affected environment (Table 23). That is, if lost can the affected environment be (a) recreated, or (b) is it a common set of characteristics and thus if lost is not considered a significant loss. Note that this criterion is not given a numerical value.

Table 23: Description of Replaceability Criteria

Criteria	Description
Yes	Affected environment is replaceable, that is, an irreplaceable resource is not damaged, or the resource is not irreplaceable (not scarce).
No	Affected environment is irreplaceable.

Level of Significance

Based on the above criteria, the significance of issues will be determined using the following formula:

$$\text{Significance} = \text{Consequence} \times \text{Probability}$$

The significance of the impact is rated as follows (Table 24):

Table 24: Impact Assessment Significant Rating

Description	Explanation	Scoring
No Impact	There is no impact	0 – 10
Low	Impacts are less important. Some mitigation is required to reduce the negative impacts.	11 – 30
Medium	Impacts are important and require attention. Mitigation is required to reduce the negative impacts.	31 – 60
High	Impacts are of high importance. Mitigation is essential to reduce the negative impacts.	61 – 89
Fatal Flaw	Impacts present a fatal flaw, and alternatives must be considered	90 – 100

Impact assessment


Note: the sub-sections set out in the section below should be read in conjunction with the impact assessment enclosed herewith as Appendix E.

Impact on wetlands

A summary of the details of the impacted wetland are presented in Table 25.

Table 25: Wetland Assessment Summary

Assessment Aspect	Yes / No	Comment
Wetlands within 500m of the project area	Yes	Unchannelled Valley Bottom (Gamagara River system)
Presence of National Freshwater Ecosystem Priority Areas (NFEPA) wetlands	No	N/A
HGM units	HGM 1 – Unchannelled Valley Bottom	

Assessment Aspect	Yes / No	Comment
Description		The unchannelled valley bottom wetland flows from the east to the west, and is associated with the Gamagara River. The system is ephemeral and the reach of the system associated with the study area has been impacted on by mining and infrastructure developments, agricultural activities and the existing rail and road networks.
Photographs		
Overall PES		Moderately Modified (C)
Hydrology		Moderately Modified (C)
Geomorphology		Largely Modified (C)
Vegetation		Moderately Modified (C)
Eco-Services (High Benefits only)		<ul style="list-style-type: none"> • Sediment trapping; • Phosphate assimilation; and • Toxicant assimilation.
EIS		High (B)
Hydrological/Functional Benefit		Moderate (C)
Direct Human Benefits		Low (D)

The construction of the railway link will have a direct impact on the delineated wetland area. Notable construction activities, which include aspects such as excavations for foundations, the placement of ballast and piers, the wing walls and also the construction of the concrete block slab, pose a moderate risk (post-mitigation) to the system.

Mitigation measures have been prescribed for this project, but moderate risks (post mitigation) (Table 26) are still expected for the placement of the subgrade and ballast within the wetland, the construction of the wing walls and also the changes to the drainage patterns. These moderate risks may be attributed to the direct nature of the impact to the wetland, and the longevity of the aspect. The moderate risks (pre-mitigation) (Table 26) associated with aspects such as excavations; pier placement and setting of the concrete slab are all re-assigned a low risk based on the assumption that the prescribed mitigation measures will be implemented. The low risks (post-mitigation) may be attributed to the short-term (construction phase) nature of the aspects, and also the ephemeral nature of the watercourse. It is also worth noting that the site proposed for the bridge is also disturbed by what appears to have been a dam wall (of sorts).

With regards to the operational phase of the project, Moderate risks (without mitigation) (Table 26) were determined for the altered drainage patterns, storm water management and use of the railway line by trains. The significance of these moderate risks may be attributed to both the severity of the impact, but also the longevity (lifespan) of the risk. No construction phase aspects are considered to pose a moderate risk post mitigation. The Moderate operational risks were re-allocated to a Low risk based on the assumption that mitigation measures will be implemented.

Despite the risks posed to the water resources during the construction phase of the project, these are deemed short-term and necessary for the project. Furthermore, prescribed mitigation measures can further reduce the level of risk. Considering the status and functioning of the wetland ecosystem, the operational risks are expected to be low. In light of the above mentioned, no significant fatal flaws could be identified for the proposed project. Due to these low risks, a General Authorisation is permissible for this project, as per the recommendation in the Wetland Assessment Report (Appendix C-2).

Table 26: Description of Consequence Criteria: Wetlands

Aspect	Without Mitigation	With Mitigation
Construction Phase		
1. Removal of vegetation	Moderate Detrimental	Slight Detrimental

Aspect	Without Mitigation	With Mitigation
2. Stripping and stockpiling of top soil	Moderate Detrimental	Slight Detrimental
3. Excavations for foundations and servitudes	Moderate Detrimental	Slight Detrimental
4. Placement of subgrade and ballast material	Moderate Detrimental	Moderate Detrimental
5. Pier placement	Moderate Detrimental	Slight Detrimental
6. Construction of wing walls	Moderate Detrimental	Moderate Detrimental
7. Setting of concrete slab deck	Moderate Detrimental	Slight Detrimental
8. Clearing of areas for infrastructure	Slight Detrimental	Slight Detrimental
9. Hardening of surface areas	Slight Detrimental	Slight Detrimental
10. Management of storm water	Slight Detrimental	Slight Detrimental
11. Drainage pattern changes	Moderate Detrimental	Slight Detrimental
12. Site office, laydown and storage areas	Slight Detrimental	Slight Detrimental
13. Operation of equipment and machinery	Slight Detrimental	Slight Detrimental
14. Vehicle activity	Slight Detrimental	Slight Detrimental
15. Domestic and industrial waste	Slight Detrimental	Slight Detrimental
16. Storage of chemicals, mixes and fuel	Slight Detrimental	Slight Detrimental
17. Spills and leaks	Slight Detrimental	Slight Detrimental
Operational Phase		
1. Drainage patterns change	Moderate Detrimental	Moderate Detrimental
2. Storm water management	Moderate Detrimental	Slight Detrimental
3. Rail transport	Moderate Detrimental	Slight Detrimental

The project will have a direct impact on any wetland systems, with the level of risks posed to the wetland area determined to vary from low to moderate (with mitigation). The project can be favourably considered, but all prescribed mitigation measures and recommendations must be implemented.

Construction activities associated with moderate risk levels after mitigation include the placement of subgrade and ballast material and the construction of wing walls.

The EIS of the channelled valley bottom wetland was determined to be moderate, suggesting a moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact. Refer to the Wetland Assessment (Appendix C-2).

Mitigation Measures for Impacts on HGM1

Taking into consideration the proposed development, the following recommendations are provided:

- The recommended buffer zones (15m if mitigation measures are implemented and 19m if not implemented) should be strictly adhered to during the construction phase of the project; these areas should be managed as No-Go areas. The buffer zone is not applicable to where the railway line connects to the bridge, but is applicable to supporting activities such as laydown and storage areas, and also access areas. Figure 1 indicates the 15m buffer zone around HGM1.
- Drains (or swales) should be created adjacent to the ballast to direct run-off to the wetland area. These drains must be filled with rocks to reduce run-off velocities.
- It is recommended that the construction of the bridge be timed to ensure that the bulk of the foundation work takes places during the dry season period.

The following mitigation measures are recommended:

- Construction areas should be demarcated and wetland areas marked as “No-Go” in order to prevent the unnecessary impact to and loss of these systems;
- Storm water channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion;
- Swales should be constructed alongside the base of the ballast, and filled with aggregate to dissipate flows;
- Prevent uncontrolled access of vehicles through the wetlands that can cause a significant adverse impact on the hydrology and alluvial soil structure of these areas;
- All removed soil and material must not be stockpiled within the wetland system. Stockpiling should take place outside of the water resources and away from ridge areas. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;
- During the excavation of the site, flows should be diverted around active work areas where required. Water diversion must be temporary and re-directed flow must not be diverted towards any stream banks that could cause erosion;
- Temporary and permanent erosion control methods such as silt fences must be placed between the working area and wetland system to trap sediments;
- Laydown yards, camps and storage areas must be beyond the water resource areas and associated buffers where applicable;
- During construction contractors used for the project must have spill kits available to ensure that any fuel or oil spills are cleaned-up and discarded correctly;
- As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the location of the wetland area and how to avoid it, the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;
- All chemicals and toxicants during construction must be stored in bunded areas;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site;
- Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation);
- Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems;
- No dumping of construction material on-site may take place;
- All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.

Impacts on biodiversity

The following existing impacts were observed in or adjacent to the proposed project area:

- The presence of overhead powerlines increases the risk of bird collisions;
- The proposed development area is bordered on one side by an existing railway line, a conveyor belt as well as by a major road within a few hundred metres (N14);
- An existing gravel access road as well as an Transnet substation;
- Loss of habitat due to industrial development. Satellite images of the project area show the extent of land-use change in the vicinity of the project area, most of this is associated with mining;
- Presence of an old fence line and farm road which bisects the project area; and
- Presence of alien and invasive plant species.

The proposed development is associated with the construction of a railway extension which will join two existing railway lines. The proposed construction may result in further loss and disturbance of habitat and displacement of fauna and flora.

The following potential impacts were considered on terrestrial vegetation and faunal communities during the construction phase:

- Further loss and fragmentation of the vegetation community
- Further displacement of faunal community due to habitat loss and disturbance.

The following potential impacts were considered on terrestrial vegetation and faunal communities during the operational phase:

- Continued encroachment and displacement of indigenous vegetation community by alien invasive plant species;
- Leaks, discharges, pollutant and litter from railway lines into the surrounding environment;
- Continued displacement and fragmentation of the faunal community due to ongoing habitat degradation; and
- Dust, debris and disturbance from heavy machinery and vehicles during this phase, as well as direct mortalities of fauna due to these activities.

The significance of potential impacts associated with the construction phase on vegetation communities before mitigation is high and after implementation of mitigation measures the significance is medium (Table 27). The significance of potential impacts associated with the construction phase on faunal communities before mitigation is high and after implementation of mitigation measures the significance is low.

The significance of potential impacts associated with the operational phase on vegetation communities before mitigation is high and after implementation of mitigation measures the significance is medium-low. The significance of potential impacts associated with the operational phase on faunal communities before mitigation is high and after implementation of mitigation measures the significance is low.

Table 27: Description of Consequence Criteria: Biodiversity

Aspect	Without Mitigation	With Mitigation
Construction Phase		
1. Increased degradation and fragmentation of vegetation community	Highly Detrimental	Slight Detrimental
2. Loss of diversity of indigenous faunal communities	Highly Detrimental	Slight Detrimental
Operational Phase		
1. Continued encroachment and displacement of indigenous vegetation community by alien invasive plant species	Highly Detrimental	Slight Detrimental
2. Leaks, discharges, pollutant and litter from railway lines and the loading bay area into the surrounding environment	Highly Detrimental	Slight Detrimental
3. Ongoing displacement and fragmentation of faunal community due to ongoing habitat degradation	Moderate Detrimental	Slight Detrimental

Mitigation Measures for Impacts on Biodiversity

Recommended mitigation and rehabilitation measures for impacts on vegetation communities include the following:

- As far as possible, the proposed developments should be placed in areas that have already been disturbed, along roads (such as the access road already in place) and no further loss of indigenous vegetation should be allowed. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon;
- Furthermore, blocks of indigenous vegetation should under no circumstances be fragmented further;

- The northerly side of the project area (rocky ridge area) as defined in this report, should be declared a 'no-go' area during the construction phase and all efforts must be made to prevent access to this area from construction workers and machinery;
- Culverts should be constructed under the new railway extension to aid water flow and also to facilitate the movement of fauna through the area and to thus alleviate the potentially damaging fragmentation effect of longitudinal infrastructure construction;
- A person qualified to identify fauna and flora must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna/flora that is found during construction. They should form part of the team to relocate fauna and flora of importance that would be affected by the construction activities;
- Areas of indigenous vegetation should be delineated and rehabilitation measures implemented in areas where the indigenous community is still present but degraded;
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species;
- Compilation of and implementation of an alien vegetation management plan for the entire site;
- All protected trees that are identified on the project site, must be visibly marked and avoided (Figure 13). If a tree cannot be avoided during the construction phase it may be removed, after the correct permits have been acquired in accordance with the National Forestry Act, 1998.

Recommended mitigation and rehabilitation measures for faunal community's hinge largely on protecting their habitats and ensuring it remains intact; in addition to this the following measures are recommended:

- If any faunal species are recorded during construction, activities should temporarily cease and an appropriate specialist should be consulted to identify the correct course of action;
- The feasibility of culverts under the new railway extensions must be considered. This will enable wildlife to move underneath the railway lines and thus mitigate further fragmentation effects and potential direct mortalities;
- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited.

Impacts on Heritage Resources

In terms of the significance matrices in Appendix C-3 (see Section 0 above), most of the archaeological observations fall under Landforms L1 (rocky surface) and L3 (Sandy ground, inland) Type 1 (Bedrock exposed and far from water) or Type 2 (Some soil patches and in floodplain or near feature such as a hill). In terms of archaeological traces they all fall under Class A1 (Area previously excavated) Type 1 (Little deposit remaining).

All of these ascriptions reflect poor contexts and likely low archaeological significance for these criteria. For site attribute and value assessment, all of the observations noted fall under Type 1 for Classes 1-7, again reflecting low significance, low potential and absence of contextual and key types of evidence. Overall, then, archaeological significance – by these criteria – is classified as low.

Low density heritage traces were found dispersed across most of the development footprint. From an archaeological perspective the observed heritage resources are of low significance, with no mitigation measures considered necessary.

A potential impact on archaeological artefacts would be any act or activity that would result, immediately or in future, in the destruction, damage, excavation, alteration, removal or collection from its original position, of any heritage material, object or value (as indicated in the NHRA). During the construction phase, the potential impact is the disturbance of land surface at and in the vicinity of the construction footprint. During the operational and decommissioning phase, the impact would extend to any additional disturbances.

There is a remote chance that some material of significance may still occur subsurface which, if encountered during construction, operational or decommissioning phases, should be brought to the immediate attention of the

heritage authorities. Work should be halted and SAHRA and/or the Northern Cape Heritage Agency be contacted to allow for further assessment and mitigation recommendations.

Mitigation measures for Impacts on Heritage Resources

Impacts on heritage resources are considered to be unlikely to occur. The following mitigation measures apply to the contractor during construction activities as described in the Environmental Management Programme (Appendix F).

- Personnel must be informed of what chance finds may be and what they may look like and instructed to be on the lookout for these items during excavation operations;
- In the event of a chance find, work at the find shall be stopped;
- A heritage specialist must be called in to investigate the find. The heritage specialist must provide management measures for the protection or removal of the find in consultation with South African Heritage Resources Agency (SAHRA); and
- Work can only recommence in area of the find once written permission from the SAHRA, heritage specialist and the Applicant has been obtained.

Impacts on Palaeontological Resources

Based on the following, it is concluded that the impact on palaeontological resources is anticipated to be low:

- Comparatively small footprint of the development, especially during the construction phase.
- Disturbed context of the construction footprint.
- Generally low palaeontological sensitivity of the bedrocks and superficial sediments in the study area.

Pending the discovery of significant new fossil remains before or during the construction phase, no further specialist palaeontological studies or mitigation are recommended for this project.

The ECO responsible for the Transnet railway project should be aware of the potential for important fossil vertebrate finds within consolidated older alluvial deposits along the Gamagara Wetland Delineated Area and the necessity to conserve them for possible professional mitigation. A Chance Fossil Finds Procedure for this development is outlined in Appendix C-4. Recommended mitigation of chance fossil finds during the construction phase of the proposed rail link involves safeguarding of the fossils (preferably *in situ*) by the responsible ECO and reporting of all significant finds to the SAHRA. Where appropriate, judicious sampling and recording of fossil material and associated geological data by a qualified palaeontologist, appointed by the developer, may be required. Any fossil material collected should be curated within an approved repository (museum / university fossil collection).

Environmental Management Programme

Refer to the Draft Environmental Management Programme (Appendix F).

9. Environmental Impact Statement

Based on the findings of the Basic Assessment process, no impacts of high significance or environmental fatal flaws will result from the following in relation to the linking of two rail lines of approximately 2.1 km in Sishen, Northern Cape and the following is recommended:

- Granting of an EA; and
- Registration of Section 21 (c) and (i) water uses in terms of a GA.

The construction of the railway link will have a direct impact on the delineated wetland area. Despite the risks posed to the water resources during the construction phase of the project, these are deemed short-term and necessary for the project. Furthermore, prescribed mitigation measures can further reduce the level of risk. Considering the status and functioning of the wetland ecosystem, the operational risks are expected to be low. In light of the above mentioned, no significant fatal flaws could be identified for the proposed project. Due to these low risks, a General Authorisation is permissible for this project.

The presence of two protected tree species of conservation concern was recorded in the area. Any potential impact on or relocation of these trees would need the requisite permit before continuation.

If the recommended mitigation measures are implemented strictly, the impacts on the identified environmental aspects could be considered low. It is thus recommended that the mitigation measures prescribed by the specialist reports, and included as specifications in the EMPr (Appendix F), be implemented by Transnet and the appointed Contractor.

The no-go alternative would result in the continuation of the rail line bottleneck and not enable the Manganese traffic from Hotazel area to run directly into Erts yard at Sishen and then onto the Ore line.

10. Recommendations

The EAP recommends that the following specific conditions drawn from the BA process should be considered by the DEA for inclusion in the EA that may be granted:

- Mitigation measures as included in the BA report and in more detail in the EMPr (Appendix F) must be adhered to.
- The approved EMPr must be included in the tender documentation for the Contractor to implement.
- The EMPr must be made legally binding on the developer, owners and their contractors by making it an extension of the conditions of the EA.
- A qualified Environmental Officer (EO) must be appointed for the duration of the contract
- A suitably qualified ECO must be appointed to monitor the construction phase of in terms of the EMPr, specialist recommendations and other conditions which might be stipulated in the EA.

In addition, the EAP recommends that the DWS registers the water uses for the construction of the bridge as per Section 21 (c) and (i) according to GA prior to construction within the wetland area. All maintenance activities associated with the bridge, post-construction, must then also be adhered to in accordance with the GA requirements.

11. Conclusion

The EAP believes that Transnet has followed due environmental process during the undertaking of the Basic Assessment Process. The identification of key issues by the project team and specialists during the Basic Assessment process has not shown any negative impacts that may be considered as fatal flaws.

Following the review period of the Draft Basic Assessment Report, the issues raised by I&APs and regulatory authorities will be incorporated into the Final Basic Assessment Report to assist during decision-making. The Final Basic Assessment Report will then be submitted to the Department of Environmental Affairs for consideration and decision-making on the environmental authorisation.

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