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Environmental Impact Assessment: The Proposed Upgrade and new Construction related to the Development of the Swaziland Rail Link Project, from Golela to Nsezi in KwaZulu-Natal

Draft Environmental Impact Report

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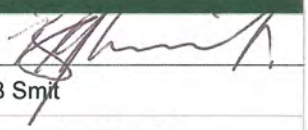
Author signature		Approver signature	
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ABBREVIATIONS AND ACRONYMS

AD	Anno Domini
AIA	Air Quality Impact Assessment
BEE	Black Economic Empowerment
BID	Background Information Document
CAPEX	Capital Expenditure
CEMP	Construction Environmental Management Programme
CWR	Continuous Welded Rail
DAFF	Department of Agriculture, Forestry and Fisheries
dB	Decibel
dBA	Sound pressure level that has been A-weighted, or filtered, to match the response of the human ear
DEA	Department of Environmental Affairs
DEIR	Draft Environment Impact Report
DM	District Municipality
DP	Distributed Power
DRO	Diesel Range Organics
DSR	Draft Scoping Report
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act, 73 of 1989
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIA	Early Iron Age
EIAR	Environmental Impact Assessment Report
EIR	Environmental Impact Report
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EMC	Environmental Management Committee
EMP	Environmental Management Programme
ENIA	Environmental Noise Impact Assessment
ESA	Early Stone Age
FEL	Front End Loading
GCF	Gross Capital Formation
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GIS	Geographic Information System
GNR/GN	Government Notice
GPS	Global Positioning System
GRO	Gasoline Range Organics
GVA	Gross Value Added
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IOCB	Indian Ocean Coastal Belt
IRR	Issues and Response Report
ISO	International Organisation for Standardisation
KBA	Key Biodiversity Areas

KZN	KwaZulu-Natal
KZNDAE	KwaZulu-Natal Department of Agriculture and Environmental Affairs
KZNSCP	KwaZulu-Natal Systematic Biodiversity Plan
LIA	Late Iron Age
LM	Local Municipality
LSA	Late Stone Age
LSD	Local Suppliers Development
MAP	Mean Annual Precipitation
MAR	Mean Annual Run-off
MAT	Mean Annual Temperature
mbgl	meters below ground level
MEC	Member of Executive Council
MOU	Memorandum of Understanding
MPAH	Maputaland-Pondoland-Albany hotspot
MSA	Middle Stone Age
Mtpa	Million tonnes per annum
NATMAP	The National Transportation Master Plan 2050
NEMA	National Environmental Management Act, 107 of 1998
NEM:BA	National Environmental Management: Biodiversity Act, 10 of 2004
NEM:WA	National Environmental Management: Waste Act, 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Atlas
NHRA	National Heritage Resources Act
NSD	Noise Sensitive Development
NSDP	National Spatial Development Perspective
NWA	National Water Act, 36 of 1998
OPEX	Operating Expense
PA	Protected Areas
PES	Present Ecological Status
PLP	Project Lifecycle Process
PoSfEIA	Plan of Study for Environmental Impact Assessment
PPP	Public Participation Process
QDS	Quarter Degree Square
RSA	Republic of South Africa
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resource Agency
SAMs	Social Accounting Matrices
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SANS	South African National Standard
SDF	Spatial Development Framework
SEA	Swaziland Environment Authority
SG	Surveyor-General
SIA	Social Impact Assessment
SMME	Small, medium and micro enterprises
SNA	Systems of National Accounts
SOC	State-Owned Company
SR	Scoping Report
STD	Sexually Transmitted Disease
Steercom	Steering Committee
t/axle	Ton per axle

TFR	Transnet Freight Rail
VdB	Vibration decibel
UPVC	Unplastised Polyvinyl Chloride
US-EPA	United States Environmental Protection Agency
WULA	Water Use Licence Application
WWF	World Wide Fund for Nature
WWTP	Waste Water Treatment Plant
ZAR	South African Rand

GLOSSARY OF TERMS

Block loads:	A grouping of wagons that are detached or coupled to make up a train.
Cross-overs:	The link between two parallel tracks.
Environment:	means the surroundings within which humans exist and that are made up of - (i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing;
Environmental Impact:	The direct effect of human activities and natural events on the components of the environment.
Environmental Impact Assessment (EIA):	The process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of a proposed activity on the environment and the surrounding community prior to major decisions being taken and commitments made.
Environmental Management Programme (EMP):	A document that contains recommendations for the control or management of the potential significant impacts of operations on the environment and recommendations to contain or mitigate actual impacts.
Feasible:	Acceptable, capable of being used or implemented successfully, without unacceptably damaging the environment.
Occupations:	The time duration required to occupy a section of track for maintenance purposes.
Pollution:	Any change in the environment which has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.
Public Participation Process:	A process of involving the public in order to identify needs, address concerns, choose options, inform decision making, plan and monitor in terms of a proposed project, programme or development.
Risk:	The scientific judgement of probability and significance of harm to the environment.
Shut:	Refers to the annual shut when maintenance of the infrastructure takes place.
Tie-ins:	The merging of tracks at turn-outs.

EXECUTIVE SUMMARY

INTRODUCTION

Aurecon South Africa (Pty) Ltd has been appointed by Transnet State Owned Company (SOC) Ltd (hereafter referred to as Transnet) to undertake an Environmental Impact Assessment (EIA) process in an effort to obtain environmental authorisation for the proposed Swaziland Railway Link and associated upgrades project.

This document outlines the process followed, describes the proposed development and the context in which it will take place, identifies the potential environmental impacts and prepares mitigation measures to alleviate negative impacts and enhance positive impacts. It presents the identification of key issues or concerns as highlighted by the relevant authorities, Interested and/or Affected Parties (I&APs) and professional judgement of the Environmental Assessment Practitioner (EAP). The results of the specialist studies, a full assessment of the impacts and proposed alternatives from part of this EIA report.

PROJECT BACKGROUND AND MOTIVATION

Transnet in collaboration with Swaziland Railway identified the construction and upgrade of the railway line between Davel in Mpumalanga and Richards Bay in KwaZulu-Natal, connecting via the Swaziland rail network, as a strategic project. The aim of the project is to unlock the potential of a multinational strategic rail corridor and divert general freight traffic off the dedicated heavy haul Richards Bay coal line which runs from Ermelo through rural KwaZulu-Natal to Richards Bay.

In terms of the National Environmental Management Act, 107 of 1998 the proposed development triggers activities which may significantly impact on the environment. As a result Transnet requires Environmental Authorisation from the competent authority, the Department of Environmental Affairs (DEA) in collaboration with the KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZNDAE) to commence with the development.

The project activities in its entirety will consist of various works, including the upgrading of existing railway sections (including re-building certain sections), construction of an entirely new rail link from Lothair in South Africa to Sidvokodvo in Swaziland and construction of new rail yards in Davel and Nsezi. These proposed works trigger a number of listed activities as specified in the National Environmental Management Act (NEMA), 107 of 1998, the National Water Act (NWA), 36 of 1998 and the National Environmental Management: Waste Act (NEM:WA), 59 of 2008.

The project holds significant advantages in relieving the general freight bound pressure on the Richards Bay coal line. It provides a strategic link to congested South African export ports, as well as encouraging economic and rail transport growth in Swaziland, thus in turn reducing the need for road transport and minimising damage to roads from heavy vehicles.

This specific draft Environmental Impact Report (EIR) pertains to the section of the project from the Golela border to the Nsezi rail yard close to Richards Bay in KwaZulu-Natal.

ENVIRONMENTAL IMPACT ASSESSMENT REQUIREMENTS

The proposed development involves listed activities, as defined by the National Environmental Management Act No 107 of 1998 (NEMA). The National Department of Environmental Affairs (DEA) is the responsible regulatory authority. Table 6, Table 7 and Table 8 (Chapter 2) summarise the applicable listed activities in terms of NEMA which are being applied for.

PUBLIC PARTICIPATION AND STAKEHOLDER ENGAGEMENT

In order to afford the I&APs the opportunity to become involved and be part of the process the public participation process as set out in the NEMA regulations was followed. During the process I&APs have been afforded the opportunity to raise issues of concern that have been recorded and included in the Final Scoping Report. In addition to this, I&APs will again be afforded an opportunity to comment on the draft EIR. This ensures that the stakeholder concerns are captured into the final EIR which will be submitted to the DEA for consideration.

The public participation process was initiated by the placement of an advertisement, in the prescribed format, in two regional (The Zululand Observer (English and Afrikaans advertisements were placed) and the Umlozi (Zulu advertisement was placed) newspapers on 20 and 24 June 2013. The newspaper advertisements provided details of the activities proposed by Transnet, requested I&APs to register and to become involved in the EIA process of the proposed project. The closing date for submission of comments by I&APs was also indicated. Proof of these advertisements can be found in Appendix C, Annexure C.

The commencement of the EIA process for the proposed activities was also advertised by fixing a large number of notice boards in conspicuous places along the proposed alignment. Full detail of these notice boards can be found in Appendix C, Annexure D.

The I&AP database compiled during the EIA process for the proposed project was informed by both the registration of the I&APs through the public notices and notification letters sent to the directly affected landowners. This database was augmented via chain referral and was continually updated as new I&APs were identified throughout the project. A complete list of the I&APs is included in Appendix C, Annexure F.

IDENTIFICATION OF KEY ENVIRONMENTAL ISSUES AND PLAN OF STUDY FOR THE EIR

A baseline description of the environment was gathered through visual inspections of the site and its surroundings, desktop studies as well as specialist findings. This information was used to assess the potential areas of study, as a result of the proposed development.

Construction phase impacts on the physical, biophysical and socio-economic environment that would occur during the construction phase of the proposed project were assessed. They are inherently temporary in duration, but may have longer lasting effects e.g. pollution of a wetland during construction could have effects that may last long after construction is over.

SUMMARY OF THE IMPACT ASSESSMENT CONDUCTED

Impacts were identified as follows:

- An appraisal of the project description and the receiving environment;
- Impacts associated with listed activities as described in Chapter 2;
- Issues highlighted by the Developer and the environmental authorities;
- Findings from the specialist studies; and
- Comments received during public participation.

The following potential significant environmental impacts associated with the Swaziland Rail Project's Golela to Nsezi upgrade are assessed in this document:

Table 1: Summary table of potential environmental impacts during the construction phase

CONSTRUCTION PHASE	
Feature	**Impact**
Watercourses	• The majority of the wetlands within the study area have been shown to be natural, and form part of the important Maputoland Wetland Cluster. • However some of these would be considered modified and have a conservation rating score of Z1 or Z2, i.e. low conservation importance. The remaining natural wetland areas associated with the local streams, pans floodplain wetlands, lakes and estuaries were mostly rated as A/B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al.*, 2012). • It should be noted that sections of the line that will be upgraded, will have a direct impact on a number of the wetlands identified or delineated in this study, while a remaining 18 wetlands fall within the 500m WULA zone and this any works within these areas will require Section 21 (c) & (i) Water Use Licenses.
Hydrology	Impacts on surface waters will occur during rail construction. Pollution from mobilised suspended solids is the major concern particularly where water is abstracted close to the watercourse crossing. The rail alignment runs close to several important hydrological features including the lake St Lucia system, Phongola Dam and Lake Eteza Nature Reserve. There are several large rivers such as the Mfolozi, Mkuze and Phonglo which flow through the region. The alignment crosses each of these rivers once. The iSimangaliso Wetland Park, which contains the Lake St Lucia system, is a World Heritage Site. The Lake St Lucia system current-day sources of fresh water inflows are the Mkuze, Mzinene, Hluhluwe and Nyalazi as well as number of smaller catchments.
Geohydrology	The affected quaternary catchments intersected by the proposed alignment include W31H, W44D, W44E, W31K, W23B, W32C, W23D, W32G, W32F, W12H and W23C. Potential sources of impact include: • Incorrect disposal of hazardous and non-hazardous materials or waste could contaminate groundwater; • Potential hydrocarbon spillages resulting from a leakage caused by a fracture/crack or rupture in the fuel storage tanks may lead to contamination of groundwater; and • Potential hydrocarbon spillages from equipment, machinery and vehicle storage may lead to contamination of groundwater.
Ecology	The study area is dominated by a mixture of urban and rural development, forestry, and various forms of agriculture, with the associated infrastructure such as roads, lakes dams and the present rail network, while traversing a wide variety habitat that range from drier bushveld in the north to more mesic (moist) coastal forests in the south. The majority of the vegetation units intersecting the railway are ‘’Threatened’’ and classified as either Critically Endangered or Vulnerable. However it was confirmed during the site investigations that the rail servitude that presently exist and where the development will take place is largely degraded or transformed, with the exception of several of the river crossings. Impacts include the following: • Loss of habitat and removal of vegetation (terrestrial and aquatic); • Increase in soil erosion; • Loss of corridors and habitat fragmentation; • Change in hydrological regimes; • Loss of rare or endangered species; and • Introduction of alien vegetation.
Heritage	• Stone tools dating from the Early and Middle Stone Age are known to occur sporadically in the area. • A number of concrete arch and metal truss bridges across various rivers have been identified.
Air Quality	The construction phase will be relatively short. It will also result in mainly nuisance impacts in the form of dust. However, the nuisance and other possible impacts should still be

	managed. Impact predicted are: • Dust releases from earthworks; and • Construction vehicle exhaust.
Waste	The significant impacts caused by waste are related to hydrocarbon spillages during construction phase, both from the removal of contaminated ballast as well as general construction activities.
Noise & Vibration	The main contributors of noise caused by the proposed upgrade of the railway line and Nsezi yard are night time operations, shunting activities and ballast corrections. Construction phase impacts are considered under the initial day and night scenario impact description.
Social	Positive impacts associated with the project include: • The creation of temporary and permanent employment opportunities and social benefits; • Opportunities for local sourcing of goods and services; • Improved road infrastructure associated with development project; • Local and regional economic benefits; and • Increased development aid/investment from government and/or project investors. Negative impacts that may be associated with this phase include: • Social and cultural disruption and conflict due to population influx; • Creation of spontaneous and informal settlements; • Possible social pathologies arising from the population influx (such as crime); • The need to secure accommodation for construction staff; • Disturbance impacts related to physical intrusion; • Displacement; and • Land use impacts and impacts on common property resources.
Socio-economic	The loss of biological assets, forestry plantations and natural vegetation, due to expropriation and reclamation of land as well as the loss of production from such assets could be included in the capital expenditure (CAPEX) and operational expenditure (OPEX) changes in final demand, respectively. Macro-economic CAPEX on a regional and local scale, and macro-economic OPEX on a regional scale were considered impacts in this specialist field.

Table 2: Summary of potential environmental impacts during the operational phase

OPERATIONAL PHASE	
Feature	**Impact**
Watercourses	• Impacts associated with rail activities in close proximity to the endorheic pan, such as potential spillages of chemical loads, surface water runoff from contaminated ballast.
Hydrology	Potential sources of surface water pollution include: • wash bays and workshops; • fuelling facilities; and • coal dust and rainfall seepage from the wagons.
Geohydrology	• Potential hydrocarbon spillages resulting from a leakage caused by a fracture/crack or rupture in the fuel storage tanks may lead to contamination of groundwater.
Ecology	• Hydrological impacts on wetlands due to the impediment of flow caused by excess ballast falling into culverts, creating berms; and • Loss of corridors and habitat fragmentation.
Heritage	• Disturbance of cultural and heritage resources.

Air Quality	• Contribution to ambient CO_2; • Contribution to ambient PM_{10}; • Contribution to ambient NO_2; and • Contribution to ambient C_6H_6.
Waste	• Maintenance activities on the yard could lead to hydrocarbon spillages.
Noise & Vibration	The main contributors of noise caused by the proposed upgrade of the Golela to Nsezi railway line are night time operations, shunting activities and ballast corrections. Construction phase impacts are considered under the future day and night scenario impact description.
Social	• Social pathologies arising from population influx (negative); and • Creation / sustaining of employment opportunities (positive);
Socio-economic	The loss of biological assets, forestry plantations and natural vegetation, due to expropriation and reclamation of land as well as the loss of production from such assets could be included in the CAPEX and OPEX changes in final demand, respectively. Macro-economic CAPEX on a regional and local scale, and macro-economic OPEX on a regional scale were considered impacts in this specialist field.

CONCLUSION AND EAP IMPACT STATEMENT

The draft DEIR provides a description of the feasible alternatives and potential impacts identified during the Scoping and Environmental Impact Assessment Phases. It also contains additional information on the affected environment, mostly drawn from the specialist studies conducted. There is a description and assessment of the potential impacts associated with the various feasible alternatives as well as an indication of potential mitigation measures, conclusions and various recommendations with regard to the way forward. A series of Appendices and Annexures containing relevant information, including the various specialist studies is attached to this report.

It is the opinion of the environmental assessment practioner (EAP) that once final, the information contained in this report and the documentation attached thereto, will be sufficient for the Department of Environmental Affairs (DEA) to make an informed decision regarding the EIA for the proposed upgrade and new construction related to the development of the Swaziland Rail Link Project for the section from Golela to Nsezi in KwaZulu-Natal. Mitigation measures are proposed to limit the potential negative impacts and to enhance the potential positive impacts.

This report provides an assessment of both benefits and potential negative impacts anticipated as a result of the proposed new upgrade and construction of the railway line and Nsezi Yard. The findings of the assessment conclude that identified significant impacts can be addressed with relevant mitigation measures, therefore, in view of the EAP, no environmental fatal flaws should prevent the proposed project from proceeding.

RECOMMENDATIONS

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations of this DEIR have been included in an Environmental Management Programme (EMP). It is recommended the EMP be updated once the final alignment of the railway line has been identified and surveyed (i.e. a site specific EMP should be compiled to compliment the current EMP). The EMP should be included in the contract of the contractor(s) appointed to construct the railway line and Nsezi Yard. The EMP would be used to monitor compliance with environmental specifications and management guidelines. The implementation of the EMP is crucial for the life cycle of the project and is fundamental in achieving the environmental management standards as set out in this report.

In order to maintain involvement of the community in the implementation of the project, it is recommended that the current communication with the local community and adjacent landowners be maintained during the construction

and operational phases of the project by means of an Environmental Management Committee (EMC), as per specifications as set out in the EMP.

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1 INTRODUCTION

Aurecon South Africa (Pty) Ltd was appointed by Transnet to provide the environmental services for the Environmental Impact Assessment (EIA) of the proposed upgrade and new construction of the Swaziland Railway Link, for the section between Golela and Nsezi in KwaZulu-Natal. The details of the Environmental Assessment Practitioner (EAP) is summarised in section 1.2 below.

1.1 Context of this report

To ensure that the requirements of NEMA are met, the DEIR contains the following information as per Section 31(2) of GN R543:

Table 3: EIR contents and chapters

GN R543	CONTENT AS REQUIRED BY NEMA	CHAPTER/ ANNEXURE
31(2) (a)	*Details of (i) the EAP who compiled the report; and*	*Before Executive Summary*
	Details (ii) the expertise of the EAP to carry out an scoping procedures;	*Appendix A*
31(2) (b)	*A detailed description of the proposed activity;*	*Chapter 1*
31(2) (c)	*A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is –*	*Not Applicable*
	(i) a linear activity, a description of the route of the activity; or	*Chapter 1*
	(ii) an ocean-based activity, the coordinates where the activity is to be undertaken;	*Not Applicable*
31(2) (d)	*A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;*	*Chapter 5 (baseline environment) and Chapter 8 (assessment of potential impacts)*
31(2) (e)	*Details of the public participation process conducted in terms of regulation (27)a, including –*	*Chapter 4*
	(i) steps undertaken in accordance with the plan of study;	*Chapter 4 (PPP) and ToR in Appendix B, Annexure J*

	(ii) a list of persons, organisations and organs of state that were identified and registered in terms of regulation 55 as interested and affected parties;	*Appendix C*
	(iii) a summary of comments and issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments;	*Appendix C*
	(iv) copies of any representations and comments received from registered interested and affected parties;	*Appendix C*
31(2) (f)	*A description of the need and desirability of the proposed activity;*	*Chapter 1*
31(2) (g)	*A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;*	*Chapter 1*
31(2) (h)	*An indication of the methodology used in determining the significance of potential environmental impacts;*	*The complete methodologies for each specialist assessment of the potential impacts are in the specialist report in Appendix B. Methodologies used for interpreting the significance – Chapter 7*
31(2) (i)	*A description and comparative assessment of all alternatives identified during the environmental impact assessment process;*	*Chapter 1*
31(2) (j)	*A summary of findings and recommendations of any specialist report or report on a specialised process;*	*Throughout Chapter 8 and also Chapter 9. Specialist reports – Appendix B*
31(2) (k)	*A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an*	*Chapter 8*

	indication of the extent to which the issue could be addressed by the adoption of mitigation measures;	
31(2) (l)	*An assessment of each identified potentially significant impact, including-*	*Chapter 8*
	(i) Cumulative impacts;	
	(ii) The nature of the impact;	
	(iii) The extent and duration of the impact;	
	(iv) The probability of the impact occurring;	
	(v) The degree to which the impact can be reversed;	
	(vi) The degree to which the impact may cause irreplaceable loss of resources;	
	(vii) The degree to which the impact can be mitigated;	
31(2) (m)	*A description of any assumptions, uncertainties and gaps in knowledge;*	*Specialist reports contained in Appendix B*
31(2) (n)	*A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;*	*Chapter 9*
31(2) (o)	*An environmental impact statement which contains-*	*Chapter 9*
	(i) a summary of the key findings of the environmental impact assessment;	
	(ii) A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	
31(2) (p)	*A draft environmental management programme containing the aspects contemplated in regulation 33;*	*Appendix E*
31(2) (q)	*Copies of any specialist reports and reports on specialised processes complying with*	*Appendix B*

	regulation 32;	
31(2) (r)	*Any specific information that may be required by the competent authority; and*	*Not applicable*
31(2) (s)	*Any other matters required in terms of sections 24(4) (a) and (b) of the Act.*	*Not applicable*

1.2 Details of the EAP

The Environmental Assessment Practitioner for the project is Dr Pieter Botha. Dr Botha is assisted by Mrs Candice Dürr (environmental scientist). Kindly take note that Mrs Claudia Neethling has resigned from Aurecon and will therefore no longer fulfil the role as public participation practitioner for this project. Ms Elise Vermeulen has been appointed in this position and all comments and queries can be sent to Ms Vermeulen. A summary of their experience and roles in the project is given below. Their full CVs can be found in Appendix A.

Dr Pieter Botha

Project Leader

Dr Pieter Botha holds a DSc from the North West University, Potchefstroom Campus (1981). He is a registered professional natural scientist with the South African Council for Natural Scientific Professions. Dr Botha is also registered as an Environmental Assessment Practitioner with the International Institution for Impact Assessment (South Africa).

Dr Botha joined Aurecon's Environmental Department in May 2010 as a Senior Environmental Practitioner, and has since been involved in various projects. These have included projects such as a Front End Loading (FEL) 1 and 2 studies of the Sishen-Saldanha ore line expansion project, and an EIA for the Isundu-Mbewu power line project awarded to Aurecon by Eskom and the FEL-1 and 2 studies for the expansion of the Port of Richards Bay.

Following a career of three decades in the public sector, he established his own consultancy with a view to make a contribution in the area of natural resources management, environmental protection and agriculture in respect of policy and legislation formulation and review, as well as the provision of capacity building in the same areas. He has also undertaken and managed a variety of complex land restitution projects for the Commission on Restitution of Land Rights in Mpumalanga and North West Provinces.

Dr Botha has managed various sections and divisions during his tenure in the public sector, and has, in this regard, been responsible for personnel management, financial management and strategic leadership.

Research has formed a vital part of the projects he has been involved in. Dr Botha started his research career as a range management research officer in the Karoo Region and learnt about the dynamics of the arid areas of South Africa and, in particular, the agricultural systems applied in those areas.

He has over three decades of experience in environmental research, policy development and implementation in South Africa, as well as writing various environmental reports. He also has knowledge and experience relating to biodiversity conservation and utilisation in the southern African region. Dr Botha has also been involved in the development and drafting of policy and subsequent legislation in various facets of the environmental field relating to biodiversity conservation, utilisation and rural development.

An important component of his varied expertise is his involvement in the public participation process (PPP) as a principal element of his diverse projects, engaging with many, different and challenging stakeholders at various different levels of engagement.

Dr Botha has led or been part of delegations in various international meetings and conferences on behalf of South Africa. This required a comprehensive in-depth knowledge of relevant subjects and policies, as well as good negotiation skills.

A copy of Dr Pieter Botha's CV is attached in **Appendix A (annexure A)**.

Mrs Candice Dürr

Assist in conducting and managing the Environmental Assessment Process. Compilation and submission of the Final EIA and EMP to the relevant authority. Liaise with authorities, stakeholders and specialists. Compilation of the water use licenses for the entire alignment.

Mrs Dürr's main focus is on environmental management of related issues within a wide range of infrastructure development which includes environmental impact assessments and Environmental Management Programmes for listed activities under the various agencies' environmental legislation. To date Mrs Dürr has gained experience on various projects located in South Africa, including the Eskom Kusile Power Station Project. Mrs Dürr is a qualified Environmental specialist and obtained her Bachelor of Science from the North West University. She is currently enrolled for the final year of her BSc Honours degree in environmental management at the University of South Africa.

A copy of Mrs Candice Dürr's CV is attached in **Appendix A (annexure B)**.

Ms Elise Vermeulen

Assist in compilation and submission of the Final EIA's and EMP to the relevant authority. Co-ordinate and liaise with authorities, stakeholders and IAP's. Compilation of the Environmental Management Programmes for the Borrow Pits.

Ms Vermeulen is a qualified Environmental Assessment Practitioner with five year's experience. She obtained a Bachelor of Science degree from the University of Pretoria and an honours degree, with specialisation in Environmental Management from the University of South Africa. Her main focus is on the environmental management of related issues within a wide range of infrastructure development, which includes conducting Environmental Impact Assessments and the compilation and enforcement of Environmental Management Programmes for listed activities under the various agencies' environmental legislation. To date Ms Vermeulen has gained significant experience while working on various projects located in South Africa and Australia.

A copy of Ms Vermeulen's CV is attached in **Appendix A (annexure C)**.

1.3 Introduction to the Project Team

The table below indicates the EIA project team, including the specialists, involved.

Table 4: Details of the EIA project team

Role in Project Team	Name	Company

Role in Project Team	Name	Company
Project Director	Mr Barend Smit	Aurecon
Project Manager and lead EAP	Dr Pieter Botha	Aurecon
EAP Assistant	Mrs Candice Dürr	Aurecon
Public Participation Office	Ms Elise Vermeulen	Aurecon
Heritage Impact Assessor	Dr Johnny van Schalkwyk	*Private*
Ecological Impact Assessor	Dr Brian Colloty	Scherman Colloty & Associates
Air Quality Impact Assessor	Mr Roelof Burger Dr Martin van Nierop Mrs Anja van Basten	Gondwana Environmental Solutions
Geohydrological Impact Assessor	Mr Louis Stroebel Mr Marius Terblanche	Aurecon
Hydrological Impact Assessor	Dr Nicolas Walker	Aurecon
Noise and Vibration Impact Assessor	Mr Morne de Jager	Enviro-Acoustic Research
Social Impact Assessor	Mr Tebogo Sebego Mrs Noeleen Greyling	Aurecon
Socio-economic Impact Assessor	Dr Stephan Jooste Mr Eben Vos Ms Justine Barnard	Aurecon

1.4 Project Background

Transnet SOC Limited (hereafter referred to as Transnet) is a government (state) owned company (SOC) and is the custodian of South Africa's railway, ports and pipelines, thereby responsible for delivering reliable freight transport and handling services that satisfy customer demand.

As such, Transnet in collaboration with Swaziland Railway identified the construction and upgrade of the railway line between Davel in Mpumalanga and Richards Bay in KwaZulu-Natal, connecting via the Swaziland rail network, as a strategic project. The aim of the project is to unlock the potential of a multinational strategic rail corridor and divert general freight traffic off the dedicated heavy haul Richards Bay coal line which runs from Ermelo through rural KwaZulu-Natal to Richards Bay.

In terms of the National Environmental Management Act, 107 of 1998 the proposed development triggers activities which may significantly impact on the environment. As a result Transnet requires Environmental Authorisation from the competent authority, the Department of Environmental Affairs (DEA) in collaboration with the KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZNDAE) to commence with the development.

The project activities will consist of various works, including the upgrading of existing railway sections (including re-building certain sections), construction of an entirely new rail link from Lothair in South Africa to Sidvokodvo in Swaziland and construction of new rail yards. These proposed works trigger a number of listed activities as specified in the National Environmental Management Act (NEMA), 107 of 1998, the

National Water Act (NWA), 36 of 1998 and the National Environmental Management: Waste Act (NEM:WA), 59 of 2008.

Due to the magnitude of the proposed project, which stretches over a distance of approximately 570 km including Swaziland (see figure 1), it was decided that three applications will be compiled as follows:

1. Davel yard and connections, DEA ref no 14/12/16/3/3/2/551;
2. Mpumalanga rail line from Davel to Nerston, DEA ref no 14/12/16/3/3/2/553;
3. KwaZulu-Natal railway line from Golela to Nsezi, DEA ref no 14/12/16/3/3/2/552.

A separate EIA process will be followed for the section in Swaziland as per the Swaziland Environmental Management Act no 5 of 2002.

Each of the three South African sections will go through the EIA process separately, although concurrently (as far as possible) in order to simplify the public participation process and to reduce any potential confusion. **This report specifically pertains to application 3 as mentioned above, i.e. the KwaZulu-Natal railway line from Golela to Nsezi (ref no: 14/12/16/3/3/2/552).**

Aurecon South Africa (Pty) Ltd was appointed by Transnet to provide the environmental services for the EIA of the entire proposed Swaziland Rail Link from Davel in Mpumalanga, through Swaziland to Nsezi in Richards Bay (Figure 1).

Figure 1: General layout of the entire Swaziland Railway Link from Davel to Nsezi, The red and purple lines indicates the new link alternatives from Lothair to Sidvokodvo. The blue line represents upgrade and construction sections of the existing railway line

1.5 Need for the Project

Transnet commissioned a concept level study in 2011 to investigate the provision of a new rail link between Lothair (Mpumalanga, South Africa) and a suitable tie-in location along the existing Swaziland railway network. The concept unlocks the potential for a multinational strategic rail corridor, while at the same time relieving pressure from the heavy haul Richards Bay Coal Line and the general freight Eastern Mainline to Maputo.

Regional support for this project was confirmed by the signing of the Inter-Governmental Memorandum of Understanding (MOU) between the South African Government represented by the Department of Public Enterprises and the Kingdom of Swaziland represented by the Department of Transport on 2 August 2012. The MOU addresses the governance of a number of matters of commercial interest to both parties, including the Swaziland Rail Link project. The multinational governance of this MOU is vested in an Executive Steering Committee (Steercom).

The signing of the Memorandum of Understanding at inter-Railway level between South Africa (Transnet) and the Kingdom of Swaziland (Swaziland Railway) on 23 November 2012 reinforced the cooperation and relationship at business and technical levels. The MOU cements the areas addressed in terms of the project structure, governance and accountability at Management (policy, control and governance) levels as well as the functional and discipline-specific fields described in terms of Project work streams. The governance of the inter-railway agreement is vested in an inter-railway Steercom.

Inter-Governmental and inter-Railway cooperation has been applied in the development stage of the Swazi Rail Link project through, amongst others:

- Inter-government meetings and cooperation, culminating in the formal signing of the MOU on August 2012.
- Media presentations in South Africa and Swaziland.
- Inter-railway Steercom and joint Project Steercom meetings on a regular basis.
- Inter-railway workshops and work stream technical collaboration meeting in South Africa as well as Swaziland.

The creation of a strategic link between South Africa and the export ports of Richards Bay, and Maputo through Swaziland has been found to be technically feasible, with certain risks attached.

The additional demand on parts of the network brought about by increases in traffic volume from sources other than Mpumalanga and central Gauteng make upgrades of the network a critical planning driver. Network upgrades required to achieve the full capacity potential of the project are critical, extensive and expensive, with costs estimated at billions of South African Rands.

The project holds significant advantages in relieving the general freight bound pressure on the Richards Bay Coal Line. It provides a strategic link to congested South African export ports, as well as encouraging economic and rail transport growth in Swaziland, thus in turn reducing the need for road transport and minimising damage to roads from heavy vehicles.

1.6 Project Description

The following information was made available to Aurecon by Transnet. Detailed information regarding the location of construction roads, bridges, location and size of borrow pits etc. were not available at the time of the compilation of this report.

The operation of trains is planned around a single railway line with crossing loops originally at 40 km apart. This spacing is to be changed to 20 km apart when traffic increases warrant it. This arrangement will provide a practical capacity, at 65% operating efficiency, of 8 and 16 trains per day respectively, assuming 336 operational days per year will be achieved.

Geotechnical studies revealed substantially poor geotechnical conditions between Phuzumoya (Swaziland) and Nsezi, thus resulting in the fact that the section between Golela and Nsezi will require the effective re-building of an entire line, which is impossible under operational conditions. This created the necessity of having to provide a new line on the Golela to Nsezi section. This new line will also be constructed to full 26 ton axle loading capability.

The only sections earmarked for *in situ* upgrade on the existing alignment are the Pongola River Bridge and the tunnel near Mtubatuba.

The 210km section of existing railway line from Golela to Nsezi (Figure 4) will carry the heaviest combined new and existing traffic within the ambit of the project. This exposes the presence of numerous sections where curves sharper than 300m radius and gradients steeper than 1:80 provide “pinch points” or constraints on capacity expansion.

To accommodate increased capacity and subsequent heavier trains, apart from the extension of existing and creation of new loops, a predicted seven (7) deviations, partial doubling or realignment outside the existing reserve will be required. The existing railway line will thus have to be upgraded.

Here new turns in the railway line will be constructed to prevent the train from derailing and to ensure the design conforms to all applicable standards. These seven locations have been identified on this section of the line where deviations or total realignment outside the present rail reserve is required to mitigate unacceptable gradients and curvature.

1.6.1 Gradients

The aspirational ruling gradient of the system infrastructure in the predominantly loaded direction towards the ports is 1:160, corresponding to that of the existing Coal Line. This gradient could not be accomplished throughout the route during detail engineering design and a compromise gradient of 1:120 was eventually achieved.

The ruling gradient in the return direction against trains primarily conveying empty wagons is equal to that of the Coal Line at 1:66. It was endeavoured to engineer the minimum length of all continuous up or down grade sections to at least 1500m. This is to allow for acceptable train handling practises by minimizing transitional longitudinal in-train forces.

Minimum departure gradients achieved are 1:177 in the direction of the ports and 1:95 in the return direction. This ensures the availability of sufficient locomotive adhesion whilst charging the train brake system as well as when bringing trains into motion after having stopped at a crossing loop.

1.6.2 Curvature

The design of the horizontal alignment is based on achieving maximum curvature within practical constraints. Inherent advantages include:

- larger curve radii are less prone to wear and consequent maintenance; and
- lateral forces in the rail as the result of high tractive and compressive in-train forces are reduced.

The minimum curve radius achieved is 300m with the aspirational radius at 400m achieved in many instances. It is recommended that the aspirational minimum curvature for FEL-3 design must be 550m.

1.6.3 Train speed

The system design is based on the following maximum permissible train speeds:

- Speed in yards: 15km/h;
- Maximum line speed: 80km/h;
- Maximum train speed: 60km/h and 80km/h for loaded and empty trains respectively. Loaded trains can reach maximum speeds of 80km/h when using train momentum and when no other more restricting speed is applicable;
- Down grade speed: 40km/h for loaded trains on 1:66 down gradients of 2km and longer in length; and
- Special speed restriction: 40km/h on the environmentally sensitive section in the vicinity of Lavumisa to Kingholm in order to reduce noise generation.

1.6.4 Bridge structures

All the rail over river bridges on this line have steel superstructures comprising of steel plate girders or through girders, or a combination of these. Whilst the condition of most of these structures is fair, there are nevertheless localised elements in poor condition which will need to be strengthened or replaced.

At the river crossings the new track is generally at a higher level than the existing track because of gradient easing. As a consequence, most of the existing river bridges will be abandoned. This is not of significant consequence as many of the existing river bridges are of steel construction and are nearing the end of their economic lives in terms of steel corrosion. Many of these structures are also of the “through-span” type which constitutes a risk to the rail operation in the case of derailment owing to a high probability of the bridge being destroyed.

It is however the recommendation that the two major river bridges on the line be retained. The bridge over the Pongola River is a reinforced concrete arch bridge, not susceptible to steel corrosion or the risk of major damage in the event of a derailment. The bridge over the Umfolozi River was largely destroyed and rebuilt after the Domoina floods in 1983.

1.6.5 Nsezi yard

The Herringbone yard at Nsezi is the only portion of that yard which has 200 wagon capability. It is currently used for staging and breaking up / consolidation of loads for the port and industrial areas. Given its direct connection to

the Coal Line and port access lines, it is proposed to use this facility by expanding it by the addition of three extra lines. Minor earthworks will be required for this purpose.

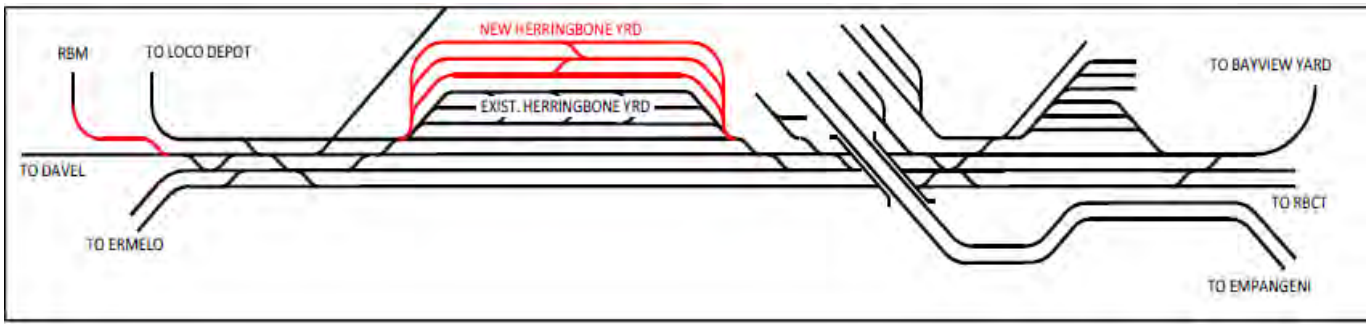

Figure 2: Nsezi yard and proposed Herringbone yard lines

Functionalities envisaged for the Nsezi yard include:

- New Nsezi-East or existing Herringbone yard to be used for Traction changes;
- Load consolidation / distribution;
- Technical inspections;
- System regulator;
- Crew changes; and
- Fuelling.

1.6.6 Traction

The mode of traction is diesel locomotives. Class 43 type diesel electric locomotives have been assumed for the entire train service. The locomotive requirements for different train loads on selected gradients are given in the table below.

Table 5: Train traction requirements

Mass per wagon in tons (Gross)	Number of wagons per train	Ruling gradient 1:	Number of locomotives required per train	Payload per train in tons	Train load in tons (Gross)
80	50	50	3	3000	4000
		66	2	3000	4000
		80	2	3000	4000
80	60	50	4	3600	4800
		66	3	3600	4800
		80	2	3600	4800
80	80	66	4	4800	6400
		80	3	4800	6400
80	100	66	4	6000	8000
		80	4	6000	8000
80	120	80	4	7200	9600

1.6.7 Level crossings

The use of level crossings will be kept to an absolute minimum. All public roads crossings will be designed as grade separation structures. Where grade separation structures are not feasible, road deviations or relocations will rather be considered.

Level crossings will be used on non-public roads, where the Priority Rating P is such that a level crossing can be allowed.

Operational designs (signage) will be provided in terms of the document “SA Road Traffic Signs Manual, Chapter 7, Signing of Railway Crossings” or other ruling documentation applicable in Swaziland.

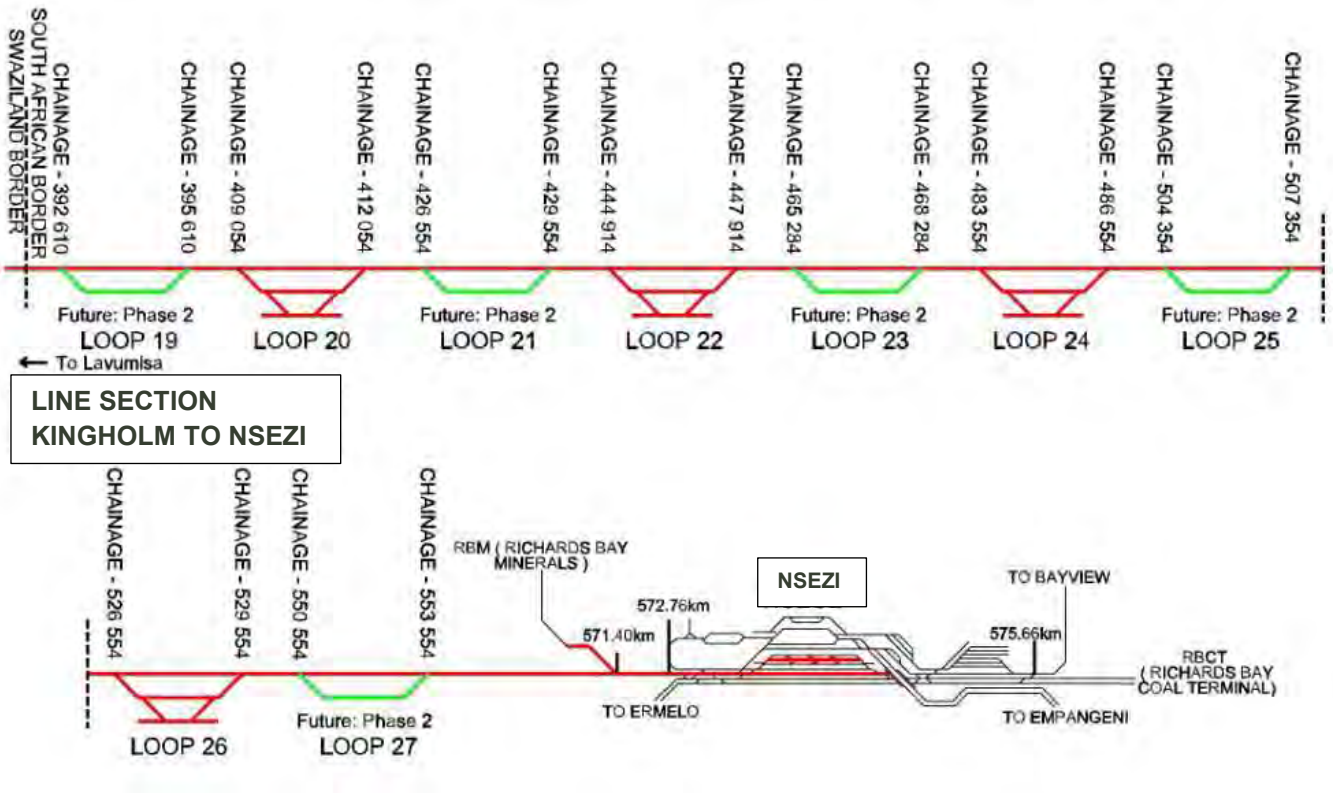

Figure 3: Route layout for Golela to Nsezi

1.6.8 Socio-economic benefit – labour component

A project of this extent will have significant direct socio-economic benefit during the construction and operational phases. Construction related jobs for the entire Swazi Rail Link alignment (from Davel, through Swaziland to Nsezi) created is estimated at 3 400 in RSA and 2 700 in Swaziland, attributable to all aspects of construction and material supply.

Potential receivers of socio-economic benefits are identified at a general level. Communities and specific service providers will be identified and pursued during the later design stage.

For KwaZulu-Natal, the annual labour element in operations and maintenance in total amount to an estimated value of R27.4 million.

1.6.9 Service roads

During construction as well as the operational phase, the project will endeavour to utilise existing service roads as far as possible. However, it is very likely that new roads for construction purposes as well as maintenance purposes will be constructed. Gravel maintenance roads will typically be 4m wide, generally following the natural ground level.

New roads to serve as access roads for neighbouring landowners may also be required, depending on the conditions agreed upon between the landowners and Transnet during the land acquisition process. Access roads will also be constructed as gravel roads at a 6m width, with vertical curves based on design speed.

These roads will be constructed as far from sensitive areas as possible.

1.6.10 Borrow pits

Transnet envisages the need of approximately thirty (30) borrow pits along the **entire** Swaziland Rail Link alignment for construction requirements. It is assumed that borrow pits along the Golela to Nsezi alignment will also be required to prevent the long haul of materials needed for construction purposes. However, detail of the location and size of the borrow pits is not yet known and will be determined during the later design stage. Once the detail has been made available, an application for authorisation of borrow pits will be made to the Department of Mineral Resources. All concerns, issues and mitigation measures identified by the specialists during the impact assessments will be taken into consideration during the planning of the location and operations of the borrow pits.

1.7 Proposed alignment alternatives for the Swaziland Railway Link Project

During the FEL 1 feasibility assessments conducted by Transnet and their appointed engineering consultants, the following alternatives for establishing a network connection point for the Swaziland Railway Line were considered.

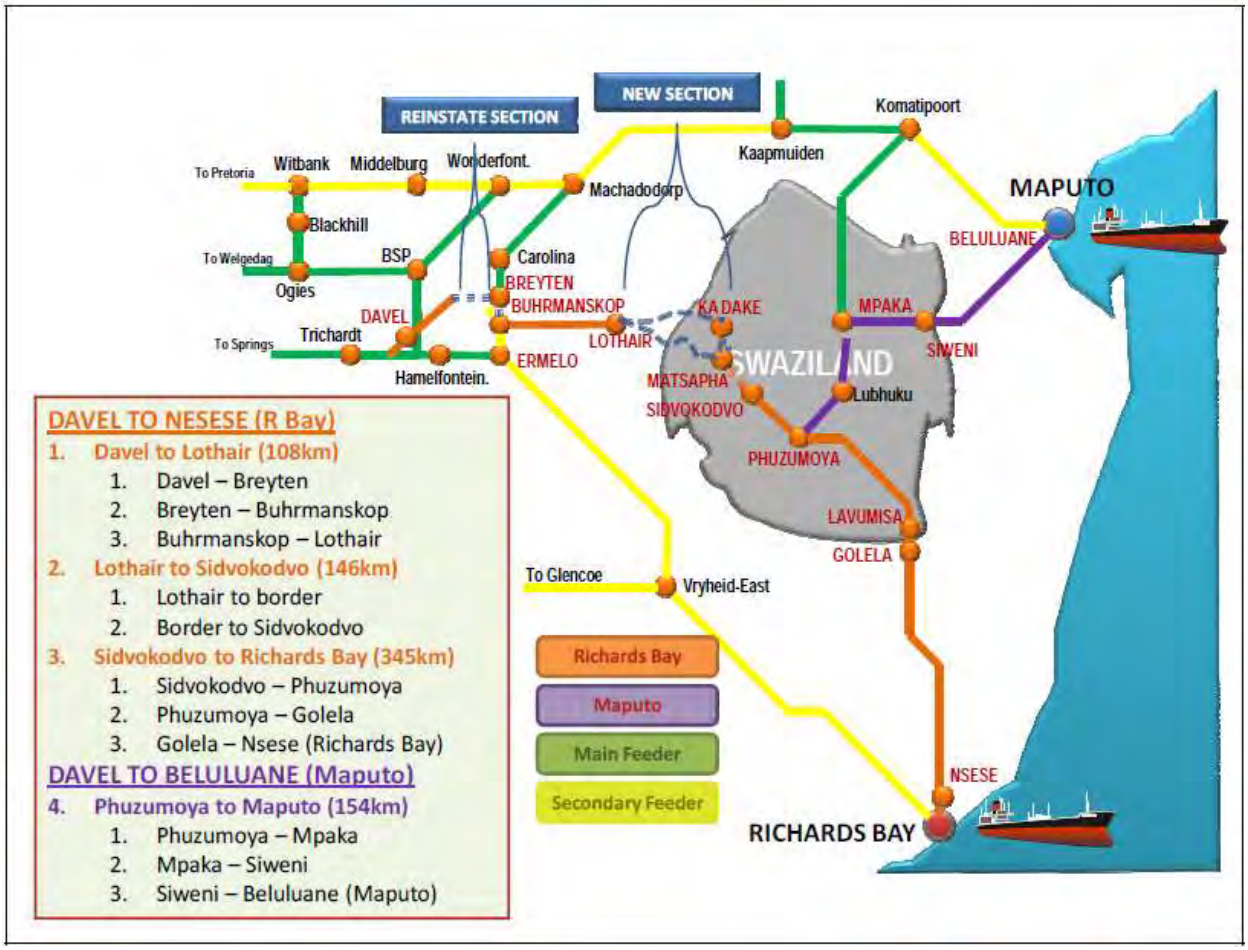

Figure 4: Existing rail line infrastructure

Utilisation of the existing Ermelo-Richards Bay railway line:

An alternative option to the upgrading of the Golela-Nsezi section is the utilisation of the existing Ermelo-Richards Bay railway line. This option was assessed at the FEL 1 feasibility phase and found to be fatally flawed due to the following reasons:

- Utilising this line would eliminate the strategic purpose of the Swaziland Railway Link project as it would remove the need to connect the South African railway line to the Swaziland railway line, and eventually also with the Mozambique Railway system via the proposed railway link between Lothair and Sidvokodvo (refer to Chapter 1.6).
- Currently, much of the coal from the South African inland coalfields is transported via the existing Coal Line through Ermelo to Richards Bay. Ermelo is currently considered the gateway to the Mpumalanga, Waterberg and Botswana coal reserves, as well as the centre of the heavy haul export channel. A further objective is to free up capacity and relieve the Coal Line of non – coal general traffic.

Thus, the upgrading of the existing Golela to Nsezi railway line will be taken into the EIA phase.

The “No Go” alternative:

The “no go” alternative, that is to retain the railway alignment as it currently is, was also assessed during the EIA process. This assessment takes into account the impacts that could occur should the project not take place. Over and above the fact that the existing yard cannot accommodate the intended increase in trains that will be travelling along the route, it has a number of negative impacts. These will include social and financial impacts at a local,

regional, national and international level due to the strategic importance of the project (as mentioned earlier). Due to these reasons the “no go” alternative is deemed not feasible as it would be against the strategic decision of rail transportation from South Africa through Swaziland to the port of Richards Bay.

1.8 Project Location

The project runs along the existing Transnet railway line from the Swaziland border at Golela to Nsezi near Richards Bay (Figure 5). Municipalities traversed include the following:

- Jozini
- The Big 5 False Bay
- Hlabisa
- Mtubatuba
- Mbonambi
- City of Mhlathuze
- Uphongolo

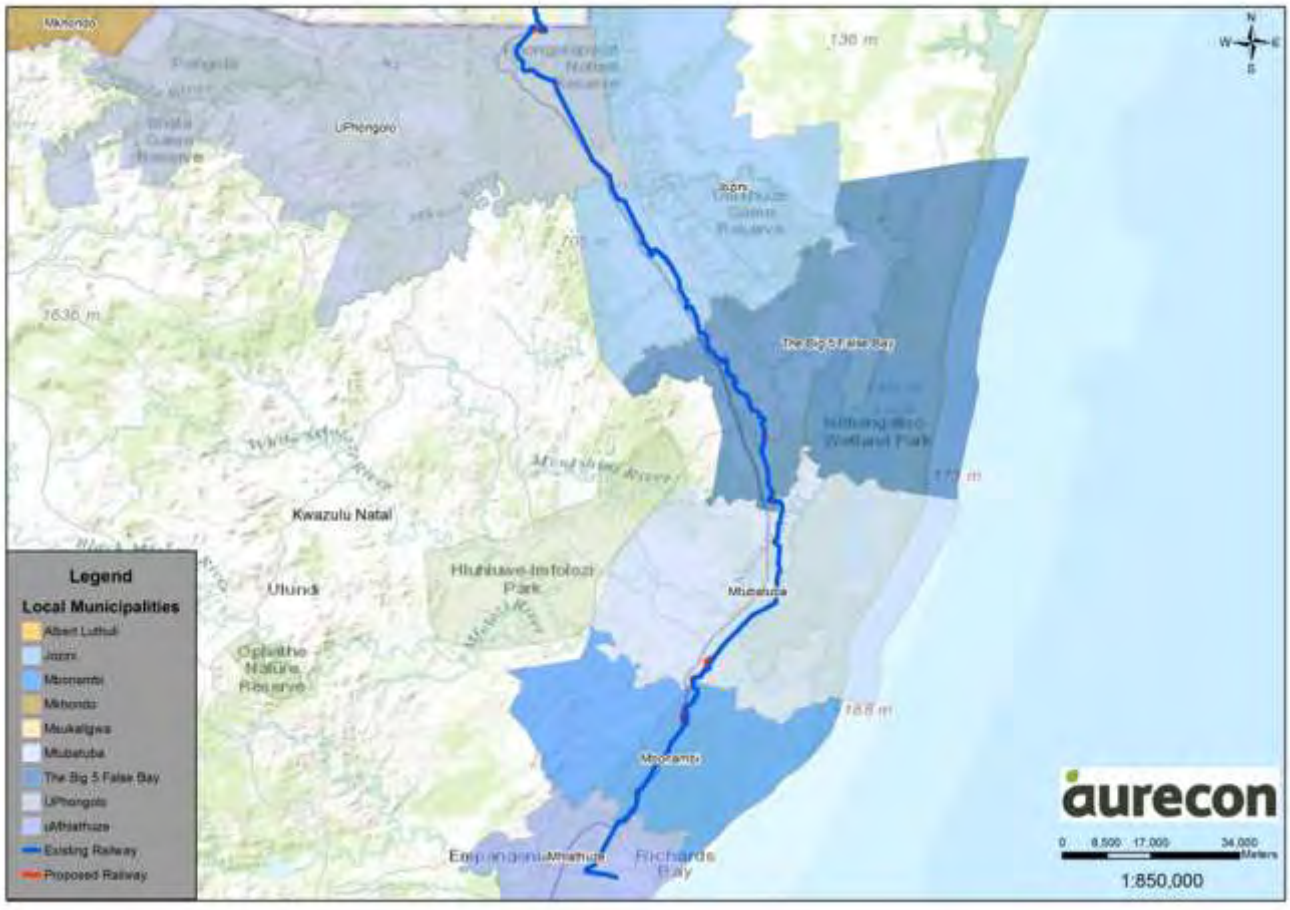

Figure 5: Proposed route alignment from Golela to Nsezi. The affected municipalities are also indicated.

2 LEGISLATIVE FRAMEWORK

The management and mitigation of the environmental impacts experienced during construction and operation is governed by environmental legislation. It is of utmost importance that this project is constructed and operated in compliance with all relevant environmental legislation whether National, Provincial and / or Local.

The environmental legislative framework and components for South Africa can best be unpacked and summarised as follows.

2.1 National Legislation

2.1.1 The Constitution

Section 24 of the Constitution of the Republic of South Africa Act, 108 of 1996 provides the basic right to an environment which is not harmful to a person's health or well-being, as well as to have the environment protected through legislation and any measures which:-

- Prevent pollution and / ecological degradation;
- Promote conservation;
- Secures ecological sustainable development; and
- The sustainable use of resources.

At the same time, Section 25 of the Constitution guarantees everyone the right of access to information which is essential for them to exercise their Constitutional right including any information pertinent to the environmental assessment (EA) or EIA process. For this reason, Public Participation is considered an essential mechanism for informing stakeholders of their rights and obligations in terms of the project.

2.1.2 The National Environmental Management Act, 107 of 1998 (NEMA)

The National Environmental Management Act (NEMA) creates the fundamental legal framework that gives effect to the environmental right guaranteed in Section 24 of the Constitution and sets out the fundamental principles that apply to environmental decision making.

2.1.2.1 The Principles of NEMA

The Principles of NEMA (Chapter 1) not only serve as a framework upon which Environmental Management is based (Section 2(1)(b)), but ensures that people and their needs are always considered (Section 2(2)). This is achieved through avoiding and minimising:

- Disturbance on ecosystems or loss of biological diversity (Section 2(4)(a)(i));
- Pollution and degradation of the environment (Section 2(4)(a)(ii)); and
- Negative impacts on the environment and people's environmental rights (Section 2(4)(a)(viii));

The principles of NEMA further require that a cautious, methodological approach be applied which takes into account knowledge or information gaps (Section 2(4)(a)(vii)) so that, as far as possible, all positive or negative

impacts on the environment are considered and assessed in order to facilitate the decision-making process in mitigating these adverse impacts (Section 2(4)(a)(i)).

2.1.2.2 Integrated Environmental Management (Chapter 5)

Section 24(1) of NEMA requires that the potential impacts of projects or activities must be considered, investigated, assessed and reported to the Competent Authority, while Section 24(2) empowers the Minister (or MEC) to identify such projects or activities which require authorisation. These activities are listed in Government Notice R (GNR) 544 of 18 June 2010 (activities requiring Basic Assessment); GNR 545 of 18 June 2010 (activities requiring full Environmental Impact Assessment) and GNR 546 of 18 June 2010 (activities requiring Basic Assessment dependent on provincial requirements) published in terms of Section 24D of NEMA. Section 24 (5) of NEMA empowers the Minister (or MEC) to draft regulations which provide a framework for the authorisation process, and which is provided in GNR 543 of 18 June 2010.

In terms of Section 24F, failure to obtain environmental authorisation for listed activities constitutes an offence and, either jointly or severally, convicted persons can be fined up to R5 000 000 as well as face imprisonment for up to ten years.

2.1.3 Additional Acts and Frameworks

In addition to NEMA, the following Acts have some bearing on the proposed activities:

- Hazardous Substances Act, 15 of 1973;
- The Conservation of Agricultural Resources Act, 43 of 1983;
- Occupational Health and Safety Act, 85 of 1993;
- Development Facilitation Act, 67 of 1995;
- National Road Transport Act, 93 of 1996;
- Extension of Security Tenure Act, 62 of 1997;
- Basic Conditions of Employment Act, 75 of 1997;
- Prevention of Illegal Eviction from and Unlawful Occupation of Land Act, 19 of 1998;
- The National Water Act, 36 of 1998;
- South Africa National Road Agency and National Roads Act, 7 of 1998;
- The National Heritage Resources Act, 25 of 1999;
- Promotion for Administrative Justice Act, 3 of 2000;
- Mineral Petroleum Resources Development Act, 28 of 2002;
- The National Environmental Management: Protected Areas Act, 57 of 2003;
- The National Environmental Management: Biodiversity Act, 10 of 2004;
- The National Environmental Management: Waste Act, 59 of 2008;
- Traditional Leadership and Governance Framework Amendment Act, 23 of 2009;
- National Railway Safety Regulator Act, 16 of 2002.

Application to the DEA for Environmental Authorisation in terms of NEMA does however not absolve the applicant from complying with other statutory requirements, and in addition the following national and provincial legislation will apply inter alia to the project.

It should also be noted that the Swaziland section of the project will also follow a separate EIA process undertaken in terms of the Swaziland legislation. This process commenced in June 2013 in collaboration with Swaziland Railway and the Swaziland Environment Authority (SEA).

2.1.4 GN R 543 – The Environmental Authorisation process

The Scoping and Environmental Impact Assessment process is identified in Part 3 of Chapter 3 (regulations 26 to 35), which prescribes the process to be followed as well as the content of the Scoping, Plan of Study for EIA (PoSfEIA) and EIA Reports. The contents of all specialist reports as well as the EMP are specified in Regulations 32 and 33 respectively, while the public participation process is described in detail in Chapter 6 of GNR 543.

Based on NEMA and GNR 543 Transnet requires Environmental Authorisation from the competent authority, the Department of Environmental Affairs. The provincial environmental authority, the KZNDEA will function as a commenting authority.

Application to the DEA for Environmental Authorisation in terms of NEMA does however not absolve the applicant from complying with the above mentioned statutory requirements. In this regard the following national and provincial legislation will apply inter alia to the project.

2.1.5 GNR 545 – Activities requiring an EIA

The proposed project and activities are listed in GNR 545, specifically:

Table 6: GN No 545 listed activities

Number and date of relevant notice	Activity No (s) (in terms of the relevant notice)	Description of listed activity as per the project description
GN No. R 545	11	This section of the proposed project is basically the construction of railway line from Golela to Nsezi in KZN.

Other listed activities listed in GNR 544 and 546 are also triggered. Activities are listed in GNR 544 (activities requiring a Basic Assessment), specifically:

Table 7: GN No 544 listed activities

Number and date of relevant notice	Activity No (s) (in terms of the relevant notice)	Description of listed activity as per the project description
GN No. R 544	9 (i) & (ii)	Storm water management facilities will be installed in some areas of the railway. It is expected that the facilities will exceed the 1000m length.
GN No. R 544	11 (ii), (iii), (x) & (xi)	The proposed project will entail the construction of facilities as well as associated infrastructure (bridges,

		channels, buildings and infrastructure & structures) of the railway line of more than 50m^2 within a watercourse or within 32 metres of a watercourse.
GN No. R 544	13	Facilities for the storage of diesel will be established along the line for refuelling purposes. The total volume of diesel to be stored at each of the storage facilities is expected to be more than 80m^3 but less than 500m^3.
GN No. R 544	18 (i)	Material shall be removed from watercourses and concrete material introduced during construction of the bridges for the proposed railway link.
GN No. R 544	20	The upgrade and construction of the Transnet-Swazi Rail link will require fill material to be sourced from borrow pits. Establishment and operation of borrow pits require mining permits in terms of the Mineral Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) or renewal thereof.
GN No. R 544	37 (a) & (b)	An extension to existing storm water facilities and sewage lines may be required. A total extension of more than 1000m and increase of throughput by 10% or more can be expected.
GN No. R 544	39 (iii)	The proposed project will require the upgrade, expansion or replacement of existing bridges and/or other structures. The upgrade will take place outside the existing servitude which in turn will increase the current footprint.
GN No. R 544	40 (iii) & (iv)	The proposed project will entail the upgrading of existing facilities as well as associated infrastructure by more than 50m^2 within a watercourse or within 32 metres of a watercourse.
GN No. R 544	49 (i), (ii) & (iii)	The proposed project may include the expansion of facilities or infrastructure for the bulk transportation of dangerous goods, namely industrial chemicals, in gas, liquid or solid form, outside an industrial complex or zone by an increased throughput capacity of 50m^3 or more per day.
GN No. R 544	53 (i) & (iii)	The proposed Transnet-Swazi Rail link entails the upgrade of the existing railway line. The entire upgrade

		will take place outside an industrial area. It is envisaged that parts of the upgrade will be outside the reserve of the existing railway lines.

The proposed project and activities are listed in GNR 546 (activities requiring Basic Assessment on provincial requirements), specifically:

Table 8: GN No 546 listed activities

Number and date of relevant notice	Activity No (s) (in terms of the relevant notice)	Description of listed activity as per the project description
GN No. R 546	3 a(ii) – aa, cc & ee	The proposed railway link will include establishment of a number of masts along the line for communication purposes which might occur in the geographical areas identified in the listing notice, this will be confirmed through specialist studies.
GN No. R 546	4 a(ii) – aa, cc & ee	The proposed construction and upgrade of the Transnet-Swazi Rail link will include the building of gravel maintenance roads that may be wider than 4m. These roads might occur in the geographical areas identified in the listing notice. This will be confirmed through specialist studies.
GN No. R 546	10 a(ii) – aa, cc, ee & ii	There will be areas of refuelling along the line. This will constitute storage of diesel in volumes less than 80m^3 which might occur within the geographical areas identified in the listing notice. This will be confirmed through specialist studies.
GN No. R 546	12 (a) & (b)	The construction and the upgrade of the railway line will constitute removal of indigenous vegetation in areas that exceed 300m^2. The affected areas may include critically endangered ecosystems depending on the alignment; this will be confirmed through the specialist studies.
GN No. R 546	13 c(ii) – aa, cc & ee	Construction and upgrade of the proposed railway will involve clearing of areas more than 1ha where indigenous vegetation can constitute more than 75% of the total vegetation cleared which might fall within the geographical areas identified in the listing notice. This will be confirmed through the specialist studies.

GN No. R 546	14 a(i)	The construction and the upgrade of the railway line will constitute removal indigenous vegetation with the total area that exceeds 5ha which might fall within the geographical areas identified in the listing notice. This will be confirmed through the specialist studies.
GN No. R 546	16 (iv) a(ii) – aa, dd & ff	The proposed railway line and associated infrastructure will include the construction of buildings and infrastructure exceeding or covering 10m^2 or more within a watercourse or within 32 metres of a watercourse.
GN No. R 546	19 a(ii) – aa, cc, ee & ii	The planned roads for construction will require the lengthening of a road by more than 1 kilometre, and possibly the widening of a road by more than 4 metres.
GN No. R 546	23 a(ii) – aa, cc, ee & ii	The project may involve upgrade of the diesel storage areas that are currently in operation along the railway line and which could fall within the geographical areas identified in the listing notice. This will be confirmed through the specialist studies.
GN No. R 546	24 a(ii) – aa, cc & ee	The project may also involve the expansion of buildings or infrastructure, expanded by 10m^2 or more within a watercourse or within 32 metres of a watercourse.

2.2 Provincial Legislation

The following KwaZulu-Natal provincial legislation will be taken into account during the EIA process:

- KwaZulu-Natal Nature Conservation Ordinance 15 of 1974.
- KwaZulu-Natal Tourism Act No 7 of 1996.
- KwaZulu-Natal Nature Conservation Act No 9 of 1997.
- KwaZulu-Natal Heritage Act No 10 of 1997.
- KwaZulu-Natal Planning and Development Act No 5 of 1998.
- KwaZulu-Natal Provincial Roads Act No 4 of 2001.
- KwaZulu-Natal Traditional Leadership and Governance Act No 5 of 2005.

3 THE EIA PROCESS DESCRIPTION

3.1 Objectives of the EIA

The objectives of the EIA are as follows:

- To ensure compliance with relevant environmental legislation and objectives;
- To identify and address significant issues and concerns through public participation;
- To describe the *status quo* (biophysical, physical and social) of the environment;
- To objectively assess various alternatives for the project;
- To evaluate the potential impact of the project, specific components of the project or activities to be conducted in an objective, independent manner based on the *status quo* environment; and
- To propose mitigation of these impacts and the implementation of the proposed measures, in the form of an Environmental Management Programme (EMP), which will conform to international and national best practise and environmental objectives.

Figure 6 below illustrates the EIA process and includes the dates of submissions and notifications conducted during the scoping phase.

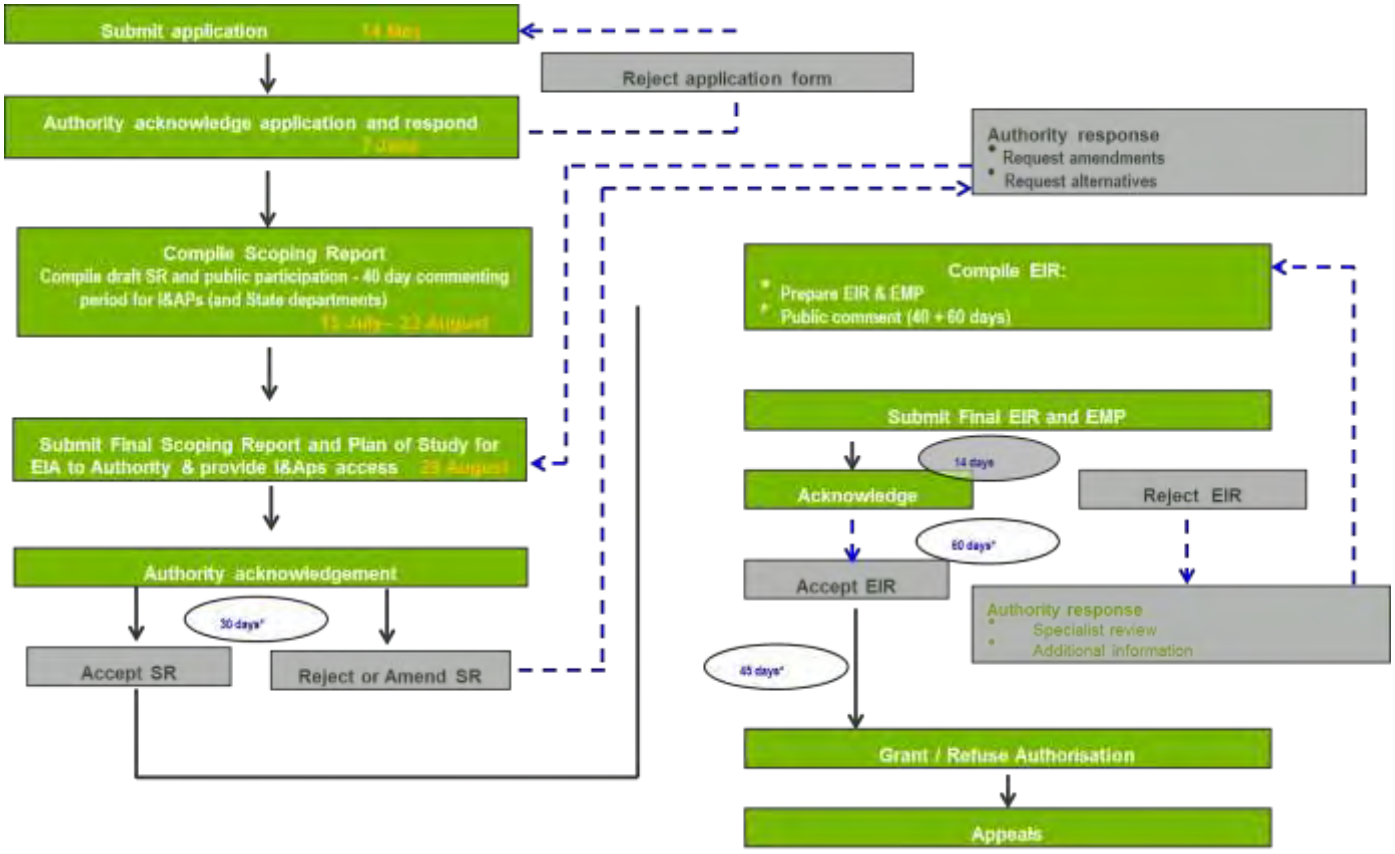

Figure 6: Flow chart of the NEMA EIA process

3.2 Assumptions and Limitations

In undertaking this investigation and compiling this draft Environmental Impact Assessment Report (DEIR) the following has been assumed or are limitations of the study, unless otherwise indicated:

- Identification of all landowners and/or occupiers of land potentially affected by the development is still in process due to incomplete available SG information. In certain instances there is also no owner information available from the Deeds office. Landowner identification and notification is on-going.

Notwithstanding the aforementioned limitations, this study is consistent with the requirements of content of EIR as stipulated in the NEMA 2010, EIA Regulations.

3.3 Authority Involvement

Aurecon, on behalf of Transnet, applied to the DEA for a deviation from regulation 15(1) on 09 April 2013. As no response was received from the DEA, and thus Aurecon submitted the application forms for the Golela to Nsezi section of the Swaziland Railway Link project on 14 May 2013, attaching the above mentioned request for deviation thereto. The Department responded on 28 May 2013, rejecting the application forms on the grounds of rejection of the application for deviation from regulation 15(1). However, after a meeting between Transnet and the DEA on 29 May 2013, the DEA issued the project with an acceptance letter dated 07 June 2013. The acceptance of the applications was on condition that regulation 15(1) is fulfilled and proof of notification to landowners submitted to the Department no later than 30 June 2013. This condition has been complied with and the proof of such notification has been submitted to DEA on 28 June 2013. This has been accepted by the DEA. The KZNDAE was also informed of the submitted application.

Upon review of the Scoping Report by the KZNDAE, the department questioned the independence of the appointed specialist as various specialist assessments were conducted “in-house” by qualified Aurecon specialists. As this was previously unheard of in Aurecon’s experience and as Aurecon was appointed as the independent environmental assessment practitioner, Aurecon requested legal advice on the issue from Mr James Cross of the Attorneys Mervyn Taback Incorporated. In paragraphs 2.1.1.6 and 2.1.1.7 of the legal opinion the following interpretation of the NEMA provisions regarding independence of an EAP and specialist are provided:

“2.1.1.6 It is evident that notwithstanding the scope of services to be performed by EAPs as described in the regulations (i.e. the planning, management and coordination of environmental impact assessments), there is no provision barring the EAP from also being the person compiling specialist reports or undertaking specialised processes as required and prescribed by the 2010 Regulations. Acting in the capacity of a Specialist Assessor or a person undertaking a specialised process, in addition to also acting as an EAP, is not specifically excluded in the definition referred to above.

2.1.1.7 It is clear however that the EAP, Specialist Assessors and persons undertaking a specialised process have to be independent. That is, neither the EAP nor the entity or person responsible for any one specialist study or process can have any one of the interests referred to in the definition of “independence”.”

The communication in this regard together with the legal advice can be found in Appendix D, Annexure G.

4 THE PUBLIC PARTICIPATION PROCESS (PPP)

4.1 Introduction

Consultation with the public forms an integral component of the environmental authorisation process. The PPP in particular allows Interested & Affected Parties (I&APs) and other identified stakeholders to be informed about potential decisions that may affect them, and it affords them the opportunity to influence those decisions. Through effective Public Participation informed decision making by the Competent Authority is ensured, as the views of all parties affected regarding a proposed activity have been considered.

As per the Integrated Environmental Management Guidelines Series 7 (2010), published by the Department of Environmental Affairs, the benefits of public participation include the following:

- It provides an opportunity for I&APs, EAP's and the Competent Authority to obtain clear, accurate and understandable information about the environmental impacts associated with the proposed activity or implications of a decision;
- It provides I&APs with an opportunity to voice their support, concerns and questions regarding the project, application or decision;
- It provides I&APs with the opportunity of suggesting ways for reducing or mitigating any negative impacts of the project and for enhancing its positive impacts;
- It enables an applicant to incorporate the needs, preferences and values of affected parties into its application;
- It provides opportunities for clearing up misunderstandings about technical issues, resolving disputes and reconciling conflicting interests, it is an important aspect of securing transparency and accountability in decision-making; and
- It contributes toward maintaining a healthy, vibrant democracy.

4.2 Approach to the Public Participation Process

The approach followed for the PPP to date and which will continue throughout the EIA Process is as per Chapter 6 of the Environmental Impact Assessment Regulations, 2010 published in Government Notice No 543 of 18 June 2010.

The following Guideline Documents published by the DEA are also being utilised to inform the Public Process;

- Integrated Environmental Management Guideline Series 7 – Public Participation in the EIA Process, Department of Environmental Affairs (2010); and
- Public Participation Guidelines, Guideline Document 4 (DEA, 2006).

4.3 Public Participation Process to date

The public participation process commenced in June 2013 and included the activities as listed below.

4.3.1 Placement of Advertisements

A legal notice was placed in one local newspaper and in one national paper as the project extends into the provincial boundaries of both Mpumalanga and KwaZulu-Natal. The content of the legal notice published in English, Afrikaans and IsiZulu included:

- Details regarding the application;
- The nature and location of the proposed activity;
- Where further information on the application or activity can be obtained from; and
- Manner in which representations in respect of the application may be made and details of the applicable contact person.

The notices appeared as follows:

- **The Zululand Observer** (KwaZulu-Natal): 24 June 2013 (Afrikaans & English);
- **Die Beeld** (Afrikaans Edition, National): 25 & 27 June 2013 (Afrikaans); and
- **The Umlozi** (IsiZulu Edition for KwaZulu-Natal): 20 June 2013 (IsiZulu)

Refer to Newspaper Advertisements: date of publication (Annexure C of Appendix C)

4.3.2 Process to Date

The activities conducted to date in the Environmental Impact Assessment are indicated in Table 9.

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Table 9: EIA activities to date

Activity	Timeframes
Lodging of application with DEA	**14 May 2013**
Registration of Project with DEA	**07 June 2013**
Initial notification and registration of stakeholders	**21 June 2013**
Draft Scoping Report review period	**15 July 2013 – 23 August 2013**
Draft Scoping Report submitted to the DEA	**24 July 2013**
Notification of Stakeholder and I&AP meetings	**15 July 2013**
Stakeholder and I&AP meetings	**1 August 2013**

Submit Final Scoping Report	**2 September 2013**
Final Scoping Report review period	**3 September – 25 September 2013**
Submit Final Amended Scoping Report	**10 October 2013**
Final Amended Scoping Report review period	**11 October – 31 October 2013**

4.3.3 Direct notification of landowners and other identified I&APs

In conjunction with the placement of newspaper advertisements a Background Information Document (BID) with comment and registration sheet and a notification letter was compiled and distributed through registered post to directly affected landowners along the route alignment. These documents were also distributed to other I&APs which have been identified. The BID was also available for download from the Aurecon and Transnet websites. A copy of the BID and notification letters is included in **Annexure A of Appendix C.** Proof of notification of landowners is included in **Annexure B of Appendix C.**

Affected land owners were identified following receipt of a Transnet stakeholder database which was based on existing railway line servitude information. Aurecon then proceeded to overlay the proposed alignment/corridor onto digital cadastral Surveyor General (SG) information in order to identify parent farms and farm portion boundaries which were affected by the railway alignment. Some of the available SG information was incomplete. Once a complete list of the affected properties was compiled, deed searches were undertaken in order to obtain postal addresses for the owners of affected land. Contact details for the owners of certain of the properties were however not available through the deed searches. Property descriptions, where no owner contact detail was available, were sent to the Local Municipality and to the Local Farmers Associations in order to determine who the land owners of these portions of land are. Proof of these requests is included in **Annexure E of Appendix C**. However following submission of these requests there still remained some properties for which no contact details were available. From past experiences it is noted here that it is not always practically possible to hand deliver notification letters due to the nature of certain of the properties (e.g. no one resides on the property, locked gates prevent access). A **land owner and I&AP database** has been compiled and is included in **Annexure F of Appendix C.**

Other stakeholders identified and notified other than directly affected property owners included:

- Organs of state which have jurisdiction in respect of the activity (National, Provincial and Local Authorities);
- Parastatals such as Eskom who may be affected by the proposed activity;
- Non-government organisations such as the Endangered Wildlife Trust and the KZN Wetland Forum;
- Local communities and Farmers Associations; and
- Other organisations potentially affected by the activity.

A register (I&AP database) has been opened and is being maintained which contains the contact details of:

- All persons / institutions / organisations and associations that have been notified;
- All persons / institutions that have requested to be included in the database'
- All organs of State which have jurisdiction in respect of the activity.

The I&AP database can be found in **Annexure F of Appendix C**.

4.3.4 Site Notice Boards

In order to notify the surrounding communities and adjacent landowners of the proposed development, and to invite them to participate in the EIA Process site notices were erected in conspicuous locations along the alignment between Golela and Nsezi. To ensure adequate notification of potential stakeholders, notice boards were also erected at public facilities such as Municipal Buildings, Public Libraries and popular shopping centres frequented by local residents. The notices were prepared in English, Afrikaans and IsiZulu.

Refer to Annexure D of Appendix C for a complete list indicating the locations at which the notice boards were erected, also included is a photographic record of the notice boards.

4.3.5 Issues and Response Trail

Issues, comments and concerns raised during the public participation (refer to **Annexure K of Appendix C**) process are compiled into an Issues and Response Report. All comments received up to date have been captured and distributed to members of the project team for further consideration. Responses have been provided on comments which have been received. The Issues and Response Report is used for the evaluation of environmental impacts and serves to identify issues which require further scrutiny during the EIA investigation.

4.3.6 Submission of the Draft Scoping Report

The Draft Scoping Report was submitted to the DEA on 24 July 2013. The report was also made available for review and comment by registered I&APs and key stakeholders between 15 July - 23 August 2013. The report with appendices was available for download from the Aurecon and Transnet websites. Hard copies of the reports were available for review by the public at the following venues:

- Jozini Public Library;
- Ghost Mountain Inn, Mkuze; and
- The Richards Bay Public Library.

Registered I&APs were notified of the availability of the Draft Scoping Report through post, facsimile and email.

The following organs of state received copies of the Draft Scoping Report:

- Department of Environmental Affairs
- Department of Water Affairs;
- KZNDAE
- Provincial Roads Authorities
- Department Public Works
- Department Agriculture And Land Administration
- Affected Municipalities
- Eskom
- South African National Roads Agency Limited (SANRAL)
- SAHRA
- Ezemvelo KZN Wildlife
- Department of Agriculture, Forestry and Fisheries (DAFF)

Refer to **Annexure H of Appendix C** for the proof of notification.

All comments received on the Draft Scoping Report have been included in the Issues and Response Report.

4.3.7 Submission of Final Scoping Report

The Final Scoping Report was submitted to the National Department of Environmental Affairs on the 2 September 2013. Registered I&APs were afforded an opportunity to review the report during the period of 3 September – 25 September 2013, and were requested to submit their comments directly to the DEA as per the requirements of Regulation 56. I&APs were requested to submit copies of their comments to Aurecon. The report was available on the Aurecon and Transnet websites. Refer to **Annexure I of Appendix C** for the proof of notification. All comments received by Aurecon have been included in the Issues and Response Report.

4.3.8 Submission of Final Amended Scoping Report

Following a request from the DEA to include additional information the Final Scoping Report was amended and again made available to registered I&APs for the submission of their comments to DEA. The report was available during the period of 11 October – 31 October 2013 on the Aurecon and Transnet websites. The Final Amended Scoping Report was submitted to DEA on the 10th of October 2013. All comments received by Aurecon have been included in the Issues and Response Report. Refer to **Annexure J of Appendix C** for the proof of notification.

4.4 Public Consultation

Public consultation up to date has included the following:

- 1 x Public Meeting at the Ghost Mountain Inn, Mkuze (Monday 29 July);
- 1 x Public Meeting at the Richards Bay Civic Centre (Tuesday 30 July).

Refer to **Annexure L of Appendix C** for copies of the attendance registers for this meeting and **Annexure M of Appendix C** for a copy of the presentation which was delivered at the meeting.

The purpose of the meetings was to afford I&APs an opportunity to discuss the findings of the Draft Scoping Report with members of the project team and to provide more project information where available. Furthermore the meeting also provided an opportunity for the EAP to describe the EIA Process and to ensure that I&APs were aware of the importance of their participation. It also served to identify some additional stakeholders that would be contacted and invited to participate in the process. **Refer to Annexure G of Appendix C** for a copy of the Minutes which were captured at these meetings.

Further public consultation meetings to inform the public of the EIA phase of the project will be arranged shortly after the EIR has been made available for review. All registered I&APs will be informed timeously of the date and venue.

4.5 Comment on the draft Environmental Impact Report (EIR)

The Draft EIA Report will be made available to all registered I&APs for a 40 day review period between 4 March 2014 and 14 April 2014. A hard copy of the report will be made available at the following locations:

- Jozini Public Library;
- Ghost Mountain Inn, Mkuze; and
- The Richards Bay Public Library.

Furthermore the report and appendices will be available for download from the Aurecon (www.aurecongroup.com) and Transnet (www.transnet.net, under the "Business with us" tab) websites. Details of the availability of the report will be sent to all registered I&APs via post and email. All comments submitted on the report will be captured and included in the Issues and Response Report for submission to the DEA as part of the Final EIA Report.

4.6 Notification of the Environmental Authorisation

On issuing of a decision by DEA, notices will be sent to all registered Interested and Affected Parties that the Environmental Authorisation (EA) has been granted or refused and that it is available for review. These notices will indicate the process required to lodge an appeal, as well as the prescribed timeframes in which documentation should be submitted.

5 BASELINE ENVIRONMENTAL DESCRIPTION

5.1 Physical Environment

5.1.1 Regional Vegetation Types

Mucina and Rutherford (2006) describe the climate in the five regional vegetation types present along the rail line route (Figure 7), as illustrated in the two boxes below:

Zululand Lowveld (SVI 23)

The Zululand Lowveld vegetation type falls within the Savanna Biome which constitutes the southernmost extension of the most widespread biome in Africa. Savannas are largely tropic and occupy the greater area of the southern continents and also some parts of the northern continents. Most of the savannas are associated with old planation surfaces and are believed to represent a legacy of the vegetation which flourished during the Tertiary and even earlier geological periods when under hot, wet climatic conditions laterisation processes were active.

The Zululand Lowveld is classified as “SVI 23” in Mucina and Rutherford (2006). The “SVI” refers to Savannah Biome, Lowveld.

Climate

Summer rainfall with some rain in winter. Mean Annual Precipitation (MAP) of approximately 500-900 mm (highest in the southeast). Generally a frost free area. Mean monthly maximum and minimum temperatures for Mpila Camp (Hluhluwe-iMfolozi Park) 38.5ºC and 7.8ºC for February and June, respectively.

Geology and soils

Black-clay soils and duplex soils derived from a distinct variety of clastic sediments of the Dwyka, Ecca, Beaufort and igneous rocks of the Lebombo Groups (all of the Karoo Supergroup). Also well-drained soil forms occur expecially on stony slopes. Land types Fb and Ea, with some Db and Dc.

Vegetation and landscape features

Extensive flat or only slightly undulating landscapes supporting complex of various bushveld units ranging from dense thickets of *Dichrostachys cineria* and *Acacia* species, through park-like savannah with flat topped *A. tortilis* to tree dominated woodland with broad-leaved open bushveld with *Sclerocarya birrea* subsp. *caffra* and *A. nigrescens.* Tall grassveld types with sparsely scattered solitary trees and shrubs form a mosaic with the typical savannah thornveld, bushveld and thicket patches.

Western Maputoland Clay Bushveld (SVI 20)

Climate

Clay Bushveld (SVI20): Rainfall occurs in summer with dry winters. MAP about 500 – 750 mm. No incidence of frost. Mean monthly maximum and minimum temperatures 39.5 ºC and 3.1 ºC for January and July, respectively.

Geology and soils

Underlying geology comprises Cretaceous shallow-marine and coastal sediments, siltstones and conglomerates of the Zululand Group and minor rhyolites of the Jozini Formation (Karoo Supergroup). Dominant or zonal soils of this vegetation unit are latosols comprising red sandy clay loam to red clay soils (Hutton, Bainsvlei and Shortlands soil forms) and nonduplex brown calcimorphic soils comprising yellow-brown sandy clay, sandy loam to sandy clay loams (Valsrivier and Avalon soil forms). These are generally fertile soils, characterised by a moderate to high clay content (20-60%) in the A-horizon. Land types Ea, Ae, Dc, Ia and Db.

Vegetation and landscape feature

Comprises a mixed but mainly compound leaved short (5-10 m) woodlands and wooded grasslands. It occurs on the crests, upper and midslopes of gently undulating terrain. This vegetation unit is dissected by two large alluvial floodplains associated with the Mkuze and Phongolo Rivers. FOa 1 Lowveld Riverine Forest and woodland dominate these alluvial soils and numerous small floodplains associated with smaller streams.

Thembe Sandy Bushveld (SVI 18)

Climate

Summer rainfall with some rain in winter. MAP about 550 – 800 mm. Mist of the warm Indian Ocean contributes to precipitation. No incidence of frost.

Geology and soils

Shallow soils of Glenrosa and Mispah forms over Jozini Formation rhyolite lavas (Karoo Supergroup). Heavier soils have developed over dolerite in places. Rocky outcrops are typical. Land types mainly Fa, Ea and Ib.

Vegetation and landscape feature

Ridge plateaus and adjacent slightly sloping flanks covered with open, tall, sour, wiry grasslands, often dotted with low bushes and solitary savanna trees.

Maputoland Coastal Belt (CB 1)

The Maputoland Coastal Belt vegetation type falls within the Indian Ocean Coastal Belt (IOCB), which occurs as an almost 800 km long coastal strip between the South African border with Mozambique as far south as the mouth of the Great Kei River (near East London). It spans altitudes from 0-450 m. The region is very densely populated, with town such as St Lucia, Mtubtuba, Richards Bay, Stanger and Durban.

Climate

Weak rainfall seasonality near the coast tending toward summer rainfall towards the interior. Relatively high precipitation attaining annual values up to 1200 mm in coastal localities, decreasing rapidly to the interior. High humidity and temperature. Mean maximum and minimum montly temperature are 35.3 ºC and 5.5 ºC for January and June, respectively.

Geology and soils

Up to about 18 000 years old Quarternary sediments of marine origin – mainly yellowish and argillaceous redistributed sands (Berea and Muzi Formations of the Maputaland Group, respectively). Soils nutritionally very poor and well leached, except in the interdune depressions where organic-rich soils are sometimes found.

Vegetation and landscape feature

Flat coastal plain originally probably densely forested in places with a wide range of interspersed nonforest plant communities including dry grasslands (which include palm veld where special conditions prevail), hygrophilous grasslands and thicket groups. Today the vegetation landscape is composed of pockets of various forest types (separated into different vegetation units), thickets, primary and secondary grasslands, extensive timber plantations and cane fields. The belt of the IOCB immediately inland (only a few kilometres wide) and parallel to the line of Northern Coastal Forest has a characteristic appearance of very irregular dunes with generally open vegetation and *Syzygium cordatum* dotted prominently on the dunes, with many irregular dune slacks interspersed. There is little to suggest that this part of the vegetation is secondary.

Zululand Coastal Thornveld (SVI 24)

Climate

Summer rainfall but also some in winter (each winter month receiving about 20 mm, which is greater than that of any of the other savannah vegetation units for this period). MAP about 800 – 1050 mm, generally higher towards the coast. Frost very infrequent.

Geology and soils

The area is situated almost entirely on Letaba Formation basalts of the Karoo Supergroup. Soils are mainly black with a high (35-55%) clay content and depth in the range 200-300 mm. Land types are mainly Ea with some Fb and Dc.

Vegetation and landscape feature

Gently rolling landscapes supporting wooded grassland dominated by *Themeda triandra*. The bush clumps are a strong feature and are more numerous on deeper soils, with *Phoenix reclinata* and *Gymnosporia senegalensis* usually dominant. These plant communities are species-rich relative to the surrounding vegetation units. They grade into dense *Acacia* woodland on dry slopes and riverine bushland thickets and FOa 1 Lowveld Riverine Forest in valley bottoms.

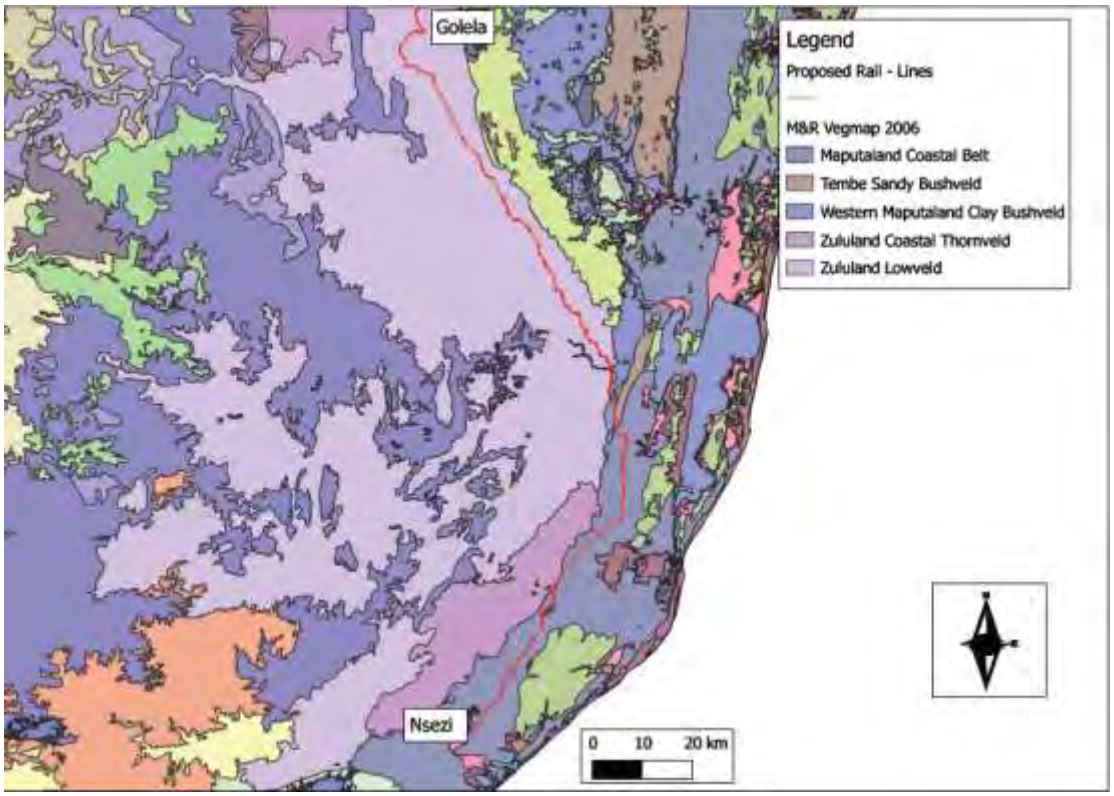

Figure 7: The position of the railway line in relation to the regional vegetation types as defined by Mucina & Rutherford (2006) and considered Vulnerable by NEM:BA

5.1.2 Noise and Vibration

According to the GNR 154 of 1992, section 2C, a local authority may:

"if a noise emanating from a building, premises, vehicle, recreational vehicle or street is a disturbing noise or noise nuisance, or may in the opinion of the local authority concerned be a disturbing noise or noise nuisance, instruct in writing the person causing such noise or who is responsible therefor, or the owner or occupant of such building or premises from which or from where such noise emanates or may emanate, or all such persons, to discontinue or cause to be discontinued such noise, or to take steps to lower the level of the noise to a level conforming to the requirements of these Regulations within the period stipulated in the instruction: Provided that the provisions of this paragraph shall not apply in respect of a disturbing noise or noise nuisance caused by rail vehicles or aircraft which are not used as recreational vehicles;"

Railway locomotives are thus exempt from these requirements. However, the impact assessment conducted proposes mitigation measures to minimise the impact of noise on the environment as described in the baseline description below.

The most important roads that the railway route currently or is proposed to traverse is the N2 and the R22 routes and are illustrated as a yellow lines in Figure 8. Smaller less significant roads (in terms of acoustics) do feature in the area.

There exist five communities identified for acoustical investigations due to the proposed railway line including the community of Lavumisa (Golela Border Post), Mkuze, Mfekayi, Hluhluwe and KwaMsane. Numerous assumed

households (GoogleEarth®, imagery date 2013) were identified via a desktop study and are illustrated as green dots in the mentioned figure.

Ground conditions and vegetation will influence the propagation of the sound from noise sources in the area as sound that is reflected from the ground would be influenced as certain frequencies would be absorbed by the ground surface. Taking into consideration available information the ground conditions could be classified as medium in terms of acoustics (acoustically medium ground absorbency).

Potentially sensitive receptors, also known as noise-sensitive developments (NSDs) were initially identified using Google Earth® and is illustrated in Figure 8.

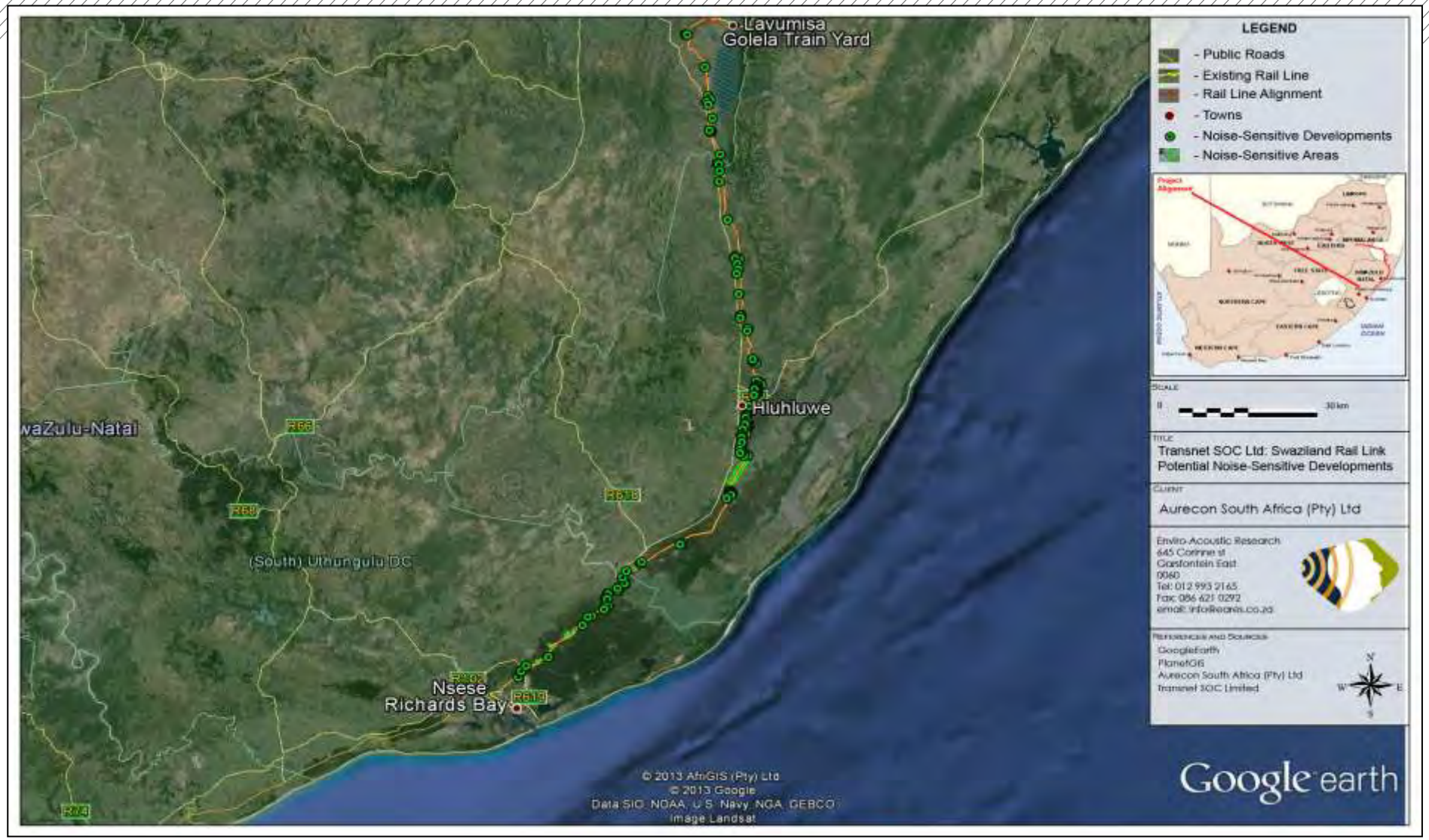

Figure 8: Noise sensitive receptors for the receiving environment

5.2 Biophysical Environment

The study area is dominated by a mixture of urban and rural development, forestry, and various forms of agriculture, with the associated infrastructure such as roads, lakes dams and the present rail network, while traversing a wide variety habitat that range from drier Bushveld in the north to more mesic (moist) coastal forests in the south.

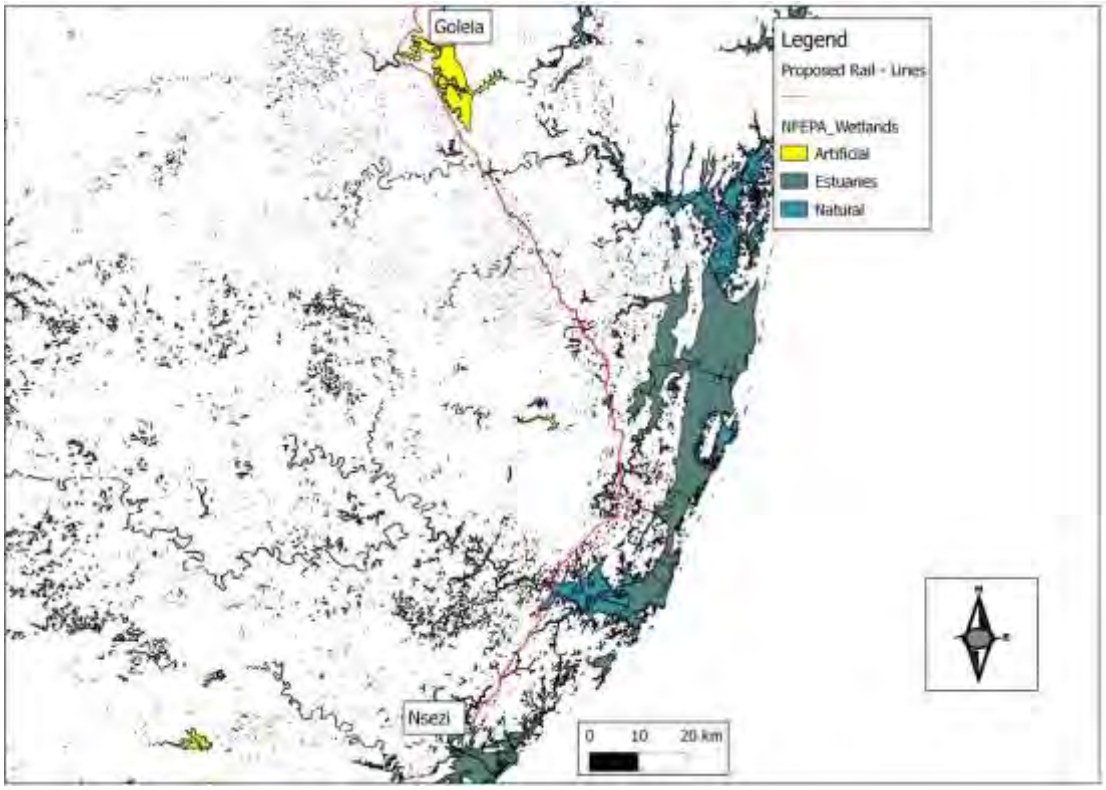

Figure 9: A map illustrating the major wetland areas within the study region

The majority of the wetlands within the study area have been shown to be natural, and form part of the important Maputoland Wetland Cluster (Figure 9). However some of these would be considered modified and have a conservation rating score of Z1 or Z2, i.e. low conservation importance. The remaining natural wetland areas associated with the local streams, pans floodplain wetlands, lakes and estuaries were mostly rated as A/B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al*., 2012).

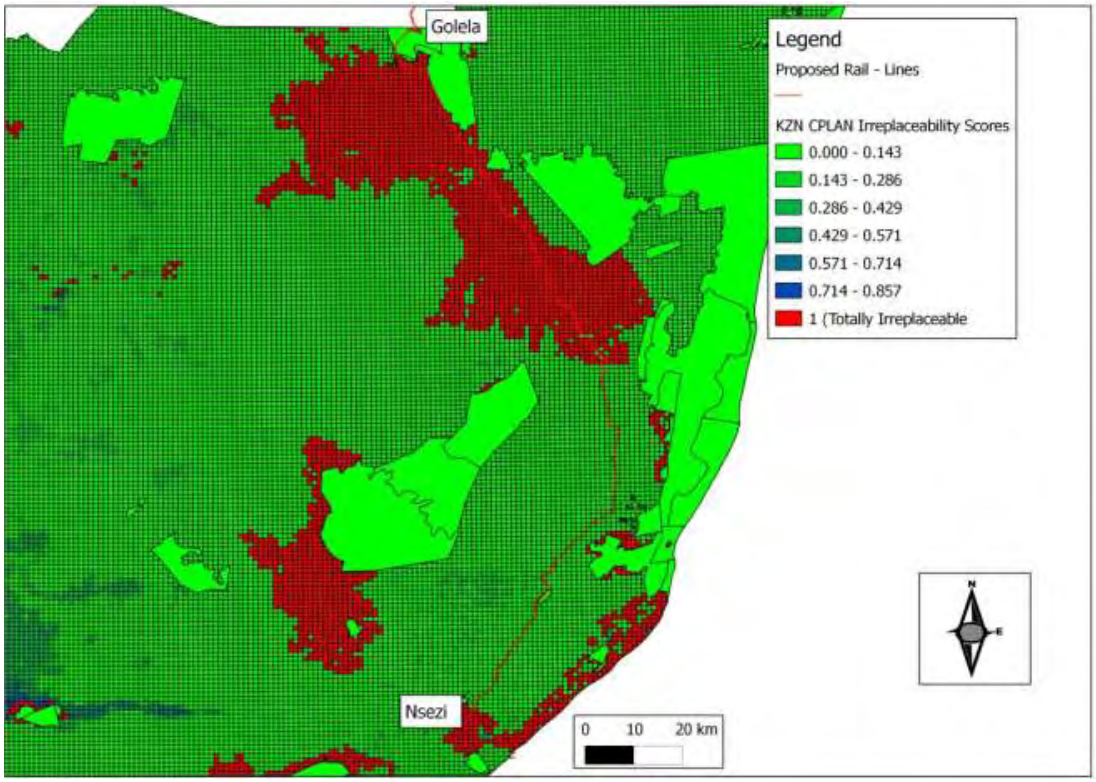

Figure 10: A map illustrating the irreplaceability categories that intersect with the line based on results from the Ezemvelo KZN Wildlife Conservation Plan

The provincial conservation authority together with a broad range of stakeholders assessed the conservation status of the province using the GIS based C-Plan Conservation Planning System. This produced a conservation map of the province at a Quarter Degree Square (QDS) level, ranking the irreplaceability of each cell or square (Figure 10). The degree of irreplaceability was based on a weighted score of the potential for important or sensitivity species / habitats to occur or known to occur within each QDS cells. Several "Totally Irreplaceable" QDS cells are intersected by line (Figure 10) and will be assessed during the EIA phase. However the majority are associated with protected mammal species such as the Black Rhino found in the large number of protected areas adjacent to the line, such as Mkuze, and Hluhluwe Nature Reserves.

Figure 10 indicates that a portion of the line falls within a Highly Significant catchment. This is possibly due to this catchment forming part of the catchment divide between the Vaal River (Renosterloopspruit – C11F) and the Olifants (Viskuile – B11A). Most of these rivers are categorised with a Present Ecological State (PES) score Class C or Moderately Modified, which is a rather unique occurrence considering the general landscape change that has occurred over time.

During the EIA phase, intensive habitat matching was conducted and ground-truthed to determine the exact status and importance of the habitats observed at a finer scale as well as identify the presence any Species of Special Concern (Faunal & Floral). The results of the assessment are captured in Chapter 8 of this report.

5.2.1 Aquatic environment

The Golela to Nsezi line falls within a large number of catchments associated with the following major rivers or lakes (Figure 11):

- Phongola

- Mkuze
- Msunduzi
- Hluhluwe
- St Lucia
- Nyalazi
- Mfolozi
- Nhlabane

All of these systems have been classified as part of the National Freshwater Ecosystem Priority Atlas (NFEPA) project (Nel *et al*., 2012).

The majority of the wetlands within the study area have been shown to be natural, and form part of the important Maputoland Wetland Cluster. However some of these would be considered modified and have a conservation rating score of Z1 or Z2, i.e. low conservation importance. The remaining natural wetland areas associated with the local streams, pans floodplain wetlands, lakes and estuaries were mostly rated as A/B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al*., 2012) (Figure 11).

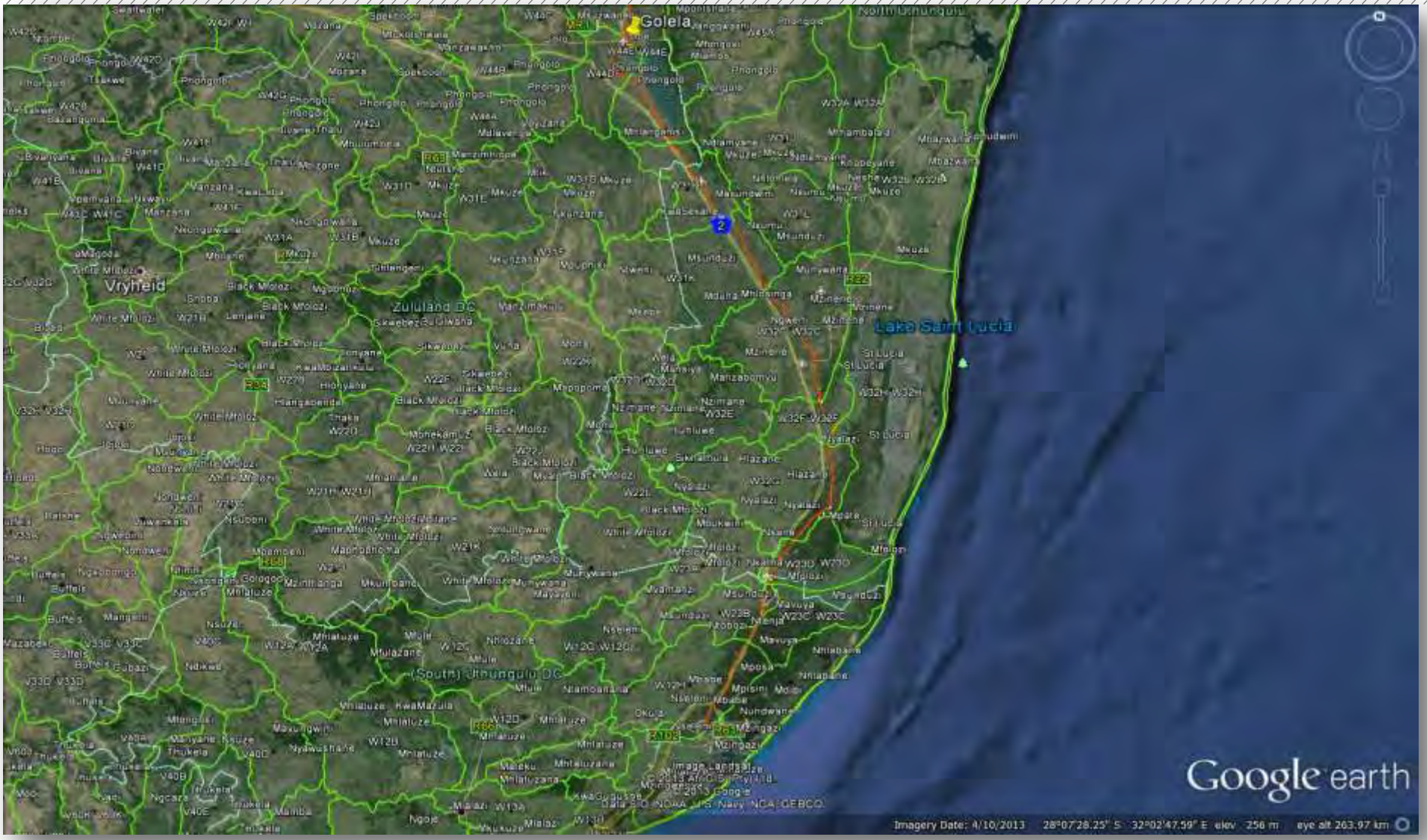

Figure 11: The project locality (red line) in relation to the respective quaternary catchments

5.2.2 Fauna

In a desktop assessment of various taxonomic databases approximately 640 known animal species are expected to occur within the region. Mammals and herpetofauna (snakes and frogs) possibly contribute between 130 – 150 of these known animal species. The expected bird species within the study area is expected to be around 350 - 380 species due to the variety of habitat types available within the study area.

One particular Millipede (*Centrobolus richardi*) was listed in several Quarter Degree Squares along the route within the coastal areas. However as most of the rail line is already in place it is anticipated that there would be little impact on any species of special concern in particular.

5.2.3 Flora

According to the Mucina and Rutherford (2006) Vegmap, five regional vegetation types are present along the rail line route. These include:

- Zululand Lowveld (SVI 23)
- Western Maputoland Clay Bushveld (SVI20)
- Tembe Sandy Bushveld (SVI18)
- Maputoland Coastal Belt (CB1)
- Zululand Coastal Thornveld (SVI24)

The Biodiversity Act (No 10 of 2004) (Amendment December 2011), lists 225 threatened ecosystems based on vegetation type (Vegmap). None of these vegetation types are listed by this Act. .

Present maps only indicate the original extent of these ecosystems, therefore the assessment of these ecosystems, their current extent and status will form a major focus of the EIA field visit, especially in light of the majority of the study region has been transformed to some degree. Therefore it is imperative that any remaining functional habitats are properly identified, in order to minimise any further impact to these areas.

Refer to chapter 8 for a detailed description of the specialist assessments of potential impacts of the project.

5.3 Social environment

The following local municipalities as indicated in Figure 12 are affected:

- Mfolozi (previously Mbonambi) Local Municipality (KZN281);
- uMhlathuze Local Municipality (KZN282);
- UPhongolo Local Municipality (KZN262);
- Jozini Local Municipality (KZN272);
- The Big 5 False Bay Local Municipality (KZN273);
- Mtubatuba Local Municipality (KZN275); and
- Hlabisa Local Municipality.

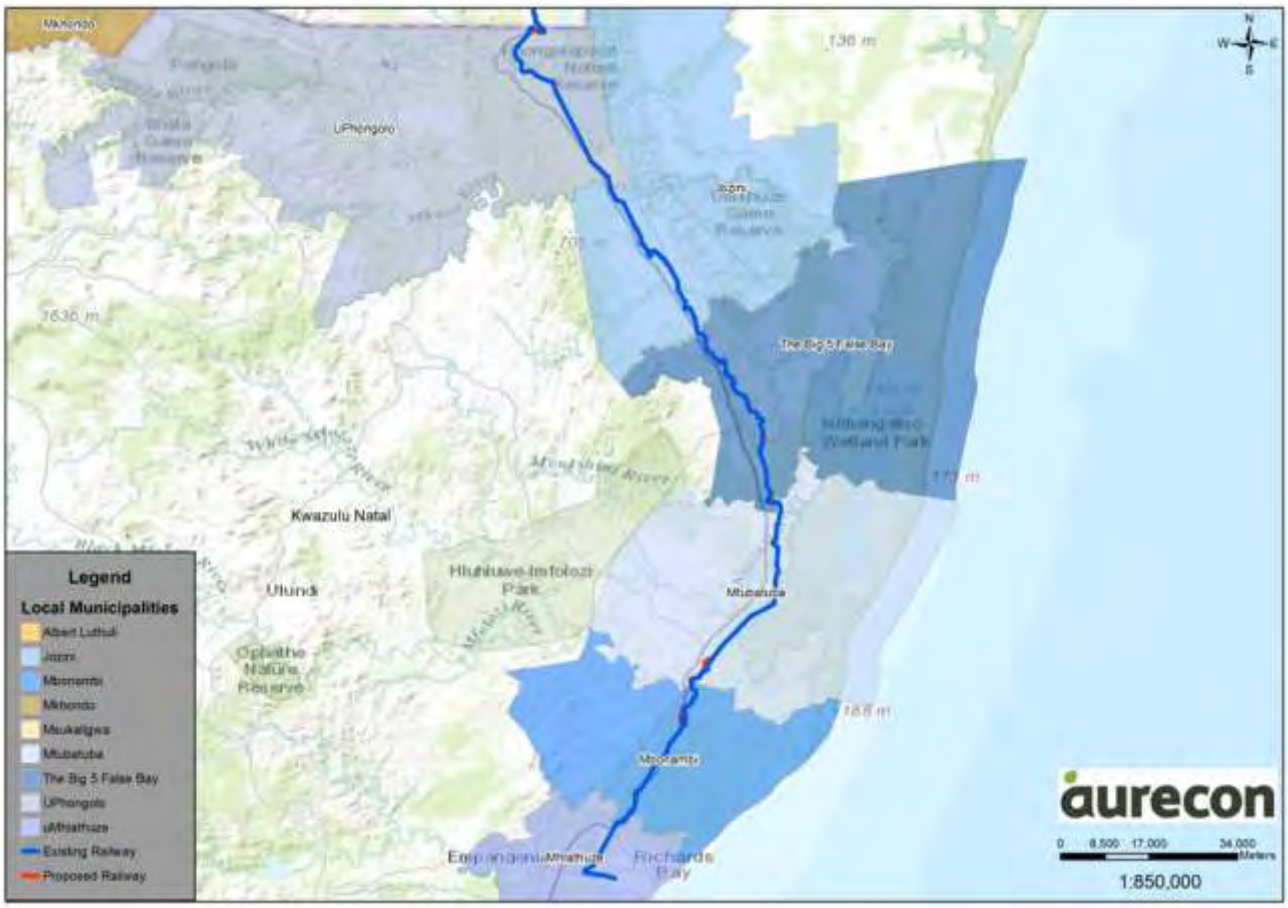

Figure 12: Affected municipalities of the KwaZulu-Natal area

The baseline social conditions of a community (community profiles) are the existing conditions and past trends associated with the human environment in which the proposed activity is to take place. The description of baseline conditions includes the relationship with the biophysical environment, historical background, social resources, culture, attitudes and social conditions, economic and population characteristics.

The social parameters of the various municipalities are described below.

uMkhanyakude District Municipality

The key drivers of the local economy of the uMkhanyakude DM has been identified as tourism and retail, and to a lesser extent agriculture and processing. Therefore, most of the development plans for this DM are focussed at stimulating growth and development in these sectors. The most prominent plans are listed below:

Corridor development:

- Zulu Ocean Corridor – (Richards Bay – St Lucia – Hluhluwe – Kosi Bay to Maputo);
- North South Corridor – (Richards Bay – Mtubu/Habisa – Hluhluwe – Mkhuze – Golela) (Similar alignment to the rail link);
- Border Heritage Corridor – (Cecil Mack Pass – Ingwavuma – Bambanini – Ngwanase – Kosi Bay); and

- Aisle of Kings Heritage – (Jozini – Sikhandane – Kwaliweni – Ingwavuma – Cecil Mack Pass).
- Maputuland Aerotropolis Corridor (including and airport development that can accommodate small charters and also providing cargo and warehousing facilities) and a waterfront development.

Mkuze Regional Airport:

The development of this airport is aimed to act as a catalyst or gateway to tourism development and expansion, and is expected to form the basis of economic growth in the DM.

Jozini Hydro Project:

Part of the economic growth development strategies for the DM, the Jozini Hydro Project is initiated as an alternative energy generation project for the DM.

Other developments:

Other notable development projects for the DM are:

- New waste treatment facilities (solid waste and effluents);
- Agriculture and timber expansion projects;
- Pulp mill and timber products manufacturing plants; and
- Fisihing industry and aquaculture development projects.

The discussed development plans for the uMkhanyakude District Municipality with its strong focus on tourism development is expected to attribute to job creation and economic growth in the DM and subsequently the province.

The Swazi Rail link can also support the development of the agriculture and timber expansion projects through transportation of the produce to external markets.

The uMkhanyakude District Vision: 2030 states 7 missions that the DM aims to achieve. Two of these mission statements will be directly addressed, namely:

- Economic and industrial growth strategy and projects; and
- Sound social and infrastructural development programme.

The DM has also developed specific programmes, designed to achieve the economic strategy of the province:

- Develop new economic corridors and nodes;
- Develop and enhance rural development, particularly farming;
- Develop key infrastructure and rehabilitate and extend existing infrastructure; and
- Develop District industrial sector, particularly agribusiness (Umkhanyakude District Municipality, 2012).

The Swazi Rail link is expected to act as an economic corridor, connecting strategic nodes such as the Richards Bay port. The infrastructure development is expected to provide opportunities for growth in especially agriculture, mining, and timber production, therefore addressing the two abovementioned mission statements.

<u>uThungulu District Municipality</u>

In a regional context uThungulu plays an important role in both the provincial and national economies as a major conduit of trade through the local port of Richards Bay. In the IDP it is stated that the local economic vision of the DM is to broaden the economic base of the district economy with the establishment of sustainable and wide range of employment opportunities by strengthening and diversifying of economic sectors. The main economic focus of the DM is tourism, agriculture and business. Therefore most of the developments are aimed at improving infrastructure that promotes these industries. The district's transportation infrastructure is under pressure, with heavy vehicles travelling to Richards Bay and the adjoining industrial areas placing considerable strain on the infrastructure. Rail is declining as a transport mode, with limited industrial linkages, with the exception of the existing coal link from Mpumalanga) (uThungulu District Municipality, 2011).

Corridors:

- Multi-sectoral activity corridor;
- Agricultural activity corridor; and
- Tourism activity corridor.

Agriculture and Tourism Developments:

- Nkandla Essential Oils Farm
- KwaBulawayo Tourism Development
- Road improvements on tourism corridors
- Zululand Birding Route
- Forests of Zululand

The development of the Swazi Rail link will contribute to the development of an enabling environment for sectoral growth since it is expected to result in additional employment opportunities, in agriculture and manufacturing. It will also support the economy, by allowing the improvement of the road network quality that has a direct impact on logistics costs.

The municipality's vision, as stated in its IDP is to be "An economically viable district with effective infrastructure that supports job creation through economic growth." (Umkhanyakude District Municipality, 2012). The Swazi Rail link is expected to contribute to providing effective infrastructure in this DM, helping it to achieve its vision.

<u>Zululand</u>

At present the Zululand District is isolated from the national economy mainly due to its location in relation to transport routes and the distance from major centres. Further, access to basic factors of production such as raw materials, skilled labour and infrastructure is generally limited. The raw materials that are found in the DM mainly relate to coal mining and agricultural activities such as maize, beef, timber and sugar production.

Poor road infrastructure has been identified as one of the main hindrances in developing the economy of the DM (Zululand District Municipality, 2011). The road infrastructure is deteriorating due to the pressure placed on it by the heavy vehicles. There a number of roads that are of strategic importance to the DM that are prioritised for improvements as listed below. The existing Richards Bay coal line is the most significant rail line in the DM. What is important to note is that the current train does not stop at stations within the corridor except to change crews and all these trains return empty from Richards Bay (Zululand District Municipality, 2011).

Roads/Corridors:

The following road improvements are prioritised in the DM due to their strategic importance for economic development and growth:

- P700 – Ulundi to Hluhluwe-Umfolozi Park;
- R66-Ulunid to Nongoma link road;
- Belgrade Pongola Road-N2 Status; and
- Nongoma Vryheid link road.

Nongoma Pongola link road Tourism development projects:

In the Zululand DM significant emphasis is placed on tourism. There are several developments planned for this DM:

- Emakhosini Opathe Herritage Park;
- Uphongolo biosphere reserve; and
- Thangami tourism development.

Other development plans:

- Water implementation plans
- Agriculture development plans

The planned developments of the Zululand DM have a strong focus on tourism development. The tourism and agriculture development plans is expected to increase the employment in the DM. The alignment of the rail link should however take the planned tourism developments into consideration.

The Swazi Rail link can contribute to the agriculture development of the DM, and also reduce the isolation of the municipality. It is important to note that the trains traversing the existing Richards Bay coal link take on the return trip with empty container. This empty capacity should be exploited and the potential of exporting produce from the DMs to the inland should be investigated.

The mission of the Zululand DM is to create an affluent district by the provision of optimal delivery of essential services; supporting sustainable local economic development; and community participation in service delivery (Zululand District Municipality, 2011). It is anticipated that the Swazi Rail link will contribute to sustainable local economic development.

From the above section it can be deduced that the development of the Swazi Rail link will primarily contribute to achieving the economic goals of the province, and more specifically the three affected DMs, that is believed to be achieved through infrastructure development. However, this is believed to provide new employment opportunities that will have secondary social benefits such as poverty alleviation and community upliftment.

5.3.1 Social Impact Assessment

Mfolozi Local Municipality

Mbonambi now called Mfolozi is an administrative area in the uThungulu District of KwaZulu-Natal in South Africa. The municipality is named after the Mbonambi Local Tribal Authority, which covers most of the municipal area and has an area of 1 210km².

Table 10 below provides the demographic characteristics of the population in the municipality.

Table 10: Mfolozi Local Municipality

Population Characteristics	
Male	59 020
Female	63 869
Total	122 889
Households	25 584
Average Household Size	4.7
Female Headed Households	46.4%
Formal Dwellings	73.49%
Population Age Distribution	**Percentage of Total Population**
0-14	36.09%
15-64	59.47%
65+	4.44%
Population density (p/km^2)	101.56 p/km²
Population growth (%)	1.4% p.a.
Unemployment rate	42.0%
Youth unemployment rate	50.40%
Household services	**Percentage (%)**
Flush toilet connected to sewerage	21.72%
Weekly Refuse Removal	8.88%
Piped Water Inside Dwelling	55.43%
Electricity For Lighting	83.71%

uMhlathuze Local Municipality

uMhlathuze Local Municipality is an administrative area in the uThungulu District of KwaZulu-Natal in South Africa. The municipality is named after the Mhlatuze River with and area of 793km². Table 11 below provides the demographic characteristics of the population in the municipality.

Table 11: uMhlathuze Local Municipality

Population Characteristics	
Male	162 942
Female	171 517
Total	334 459
Households	86 609
Average Household Size	3.6
Female Headed Households	40.7%
Formal Dwellings	89.04%
Population Age Distribution	**Percentage of Total Population**
0-14	29.33%
15-64	67.47%
65+	3.19%
Population density (p/km^2)	421.76 p/km²
Population growth (%)	1.5% p.a.
Unemployment rate	31.0%
Youth unemployment rate	40.80%
Household services	**Percentage (%)**
Flush toilet connected to sewerage	64.41%
Weekly Refuse Removal	54.97%
Piped Water Inside Dwelling	92.37%
Electricity For Lighting	93.47%

UPhongolo Local Municipality

uPhongolo Local Municipality, is a local municipality in the northern area of Zululand, in the South African province of KwaZulu-Natal. The municipality has an area of 3, 239km². Table 12 below provides the demographic characteristics of the population in the municipality.

Table 12: UPhongolo Local Municipality

Population Characteristics	
Male	59 728
Female	67 510
Total	127 238
Households	28 772
Average Household Size	4,4
Female Headed Households	48.6%
Formal Dwellings	83,46%
Population Age Distribution	**Percentage of Total Population**
0-14	36.68
15-64	58.64
65+	4.68
Population density (p/km^2)	39.28 p/km²
Population growth (%)	0.6% p.a.
Unemployment rate	35.5%
Youth unemployment rate	Unavailable
Household services	**Percentage (%)**
Flush toilet connected to sewerage	17.00%
Weekly Refuse Removal	23.52%
Piped Water Inside Dwelling	52.22%
Electricity For Lighting	73.00%

Jozini Local Municipality

Jozini is an administrative area in the Umkhanyakude District of KwaZulu-Natal in South Africa and has an area of 3 442km². Table 13 below provides the demographic characteristics of the population in the municipality.

Table 13: Jozini Local Municipality

Population Characteristics	
Male	86 116
Female	100 386
Total	186 502
Households	38 849
Average Household Size	4,8
Female Headed Households	53.7%
Formal Dwellings	77.38%
Population Age Distribution	**Percentage of Total Population**
0-14	41.26
15-64	54.81
65+	3.93
Population density (p/km^2)	54.18 p/km²
Population growth (%)	0.1%
Unemployment rate	44.1%
Youth unemployment rate	52.70%
Household services	**Percentage (%)**
Flush toilet connected to sewerage	32.36%
Weekly Refuse Removal	11.91%
Piped Water Inside Dwelling	30.33%
Electricity For Lighting	29.09%

The Big 5 False Bay Local Municipality

The Big Five False Bay is an administrative area in the Umkhanyakude District of KwaZulu-Natal in South Africa. The municipality has an area of 2 487km². Table 14 below provides the demographic characteristics of the population in the municipality.

Table 14: The Big 5 False Bay Local Municipality

Population Characteristics	
Male	16 505
Female	18 753
Total	35 258
Households	7 998
Average Household Size	4.0
Female Headed Households	51.9%
Formal Dwellings	81.04%
Population Age Distribution	**Percentage (%)**
0-14	37.51%
15-64	58.13%
65+	4.35%
Population density (p/km^2)	17.89 p/km²
Population growth (%)	1.1%
Unemployment rate	26.5%
Youth unemployment rate	31.60%
Household services	**Percentage (%)**
Flush toilet connected to sewerage	38.98%
Weekly Refuse Removal	24.65%
Piped Water Inside Dwelling	43.51%
Electricity For Lighting	42.57%

Mtubatuba Local Municipality

Mtubatuba is an administrative area in the Umkhanyakude District of KwaZulu-Natal in South Africa with an area of 1 970km². Table 15 below provides the demographic characteristics of the population in the municipality.

Table 15: Mtubatuba Local Municipality

Population Characteristics	
Male	81 314
Female	94 111
Total	175 425
Households	34 905
Average Household Size	4.9
Female Headed Households	52.8%
Formal Dwellings	81.05%
Population Age Distribution	**Percentage of Total Population**
0-14	39.37%
15-64	56.19%
65+	4.44%
Population density (p/km^2)	89,04 p/km²
Population growth (%)	1.8%
Unemployment rate	39.0%
Youth unemployment rate	46.90%
Household services	**Percentage (%)**
Flush toilet connected to sewerage	29.13%
Weekly Refuse Removal	14.66%
Piped Water Inside Dwelling	50.75%
Electricity For Lighting	65.05%

Hlabisa Local Municipality

Hlabisa is found in Umkhanyakude District of KwaZulu-Natal. The municipality is situated within the vicinity of four Tribal Authorities, viz. Mkhwanazi Tribal Authority, the Mdletshe Tribal Authority, and two Hlabisa Tribal Authorities. The municipality is assumed to be generally characterised by isolated rural communities with high levels of poverty. The most significant land use is subsistence agriculture and dispersed settlements, plantations and agriculture are found throughout the municipality. The major draw card of Hlabisa is believed to be the tourism industry centred on the adjacent game reserve. Table 16 below provide demographics of the population in the municipality.

Table 16: Hlabisa Local Municipality

Population Characteristics	
Male	32 942
Female	38 983
Total	71 925
Households	12 586
Average Household Size	5.6
Female Headed Households	58.9%
Formal Dwellings	66.47%
Population Age Distribution	**Percentage of Total Population**
0-14	58%
15-64	35%
65+	7%
Population density (p/km2)	46.3 p/km²
Population growth (%)	0.38%
Unemployment rate	52.60%
Household services	**Total**
Flush toilet connected to sewerage	4 365
Weekly Refuse Removal	958
Piped Water Inside Dwelling	4 322
Electricity For Lighting	6 978

5.3.2 Socio-economic environment

Labour and economic analysis

In the analysis of the labour and employment situation in a municipal area, it is necessary to focus attention on the size and spatial distribution of the labour force. Secondly, the characteristics of the labour market should be analysed. To this end, it is necessary to examine the supply of labour, which is derived from figures on the economically active population in a municipal area. The demand for labour, on the other hand, is an indication of employment opportunities, which are determined by the economic structure of an area along with the level and growth in economic activities. Unemployment, and in a sense transfrontier commuting, provides an indication of the difference between supply and demand and implies that equilibrium in the labour market necessitates both expansion of economic activity and the curtailment of population growth

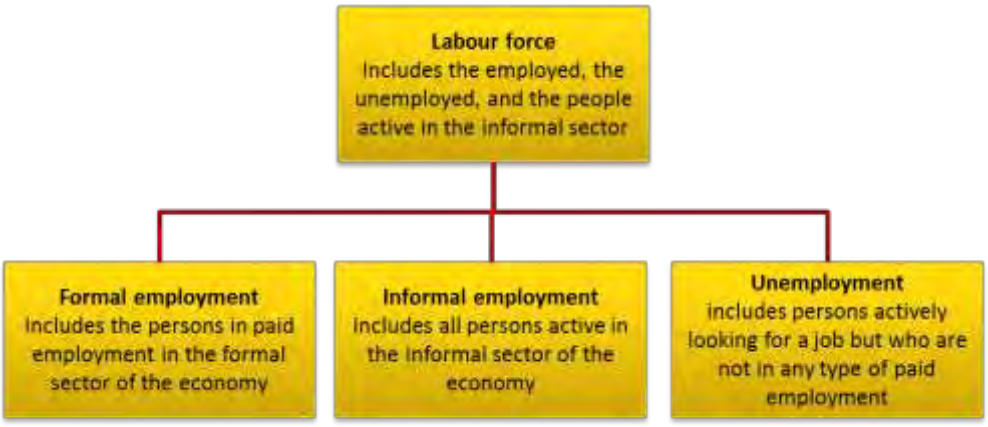

Figure 13: Composition of the labour force

A third issue that should be addressed is involvement in the peripheral sector, as not all potential workers are active in the labour market. Finally, the quality of the labour force needs to be analysed as it provides information on the employability of the workers.

The term labour force refers to those people who are available for employment in a certain area. Table 17 illustrates the different components of the labour force and the relationship between them.

Formally employed refers to people who are selling their labour or who are self-employed in the formal sector of the economy, for pay or profit. *Informally employed* includes all people who are active, for pay or profit, in the informal or unregistered sector of the economy. *Unemployed* are persons actively looking for a job, but who are not in any type of paid employment.

5.3.2.1 Description of the KwaZulu-Natal Local Municipality Labour force

Table 17: KwaZulu-Natal Local Municipality Labour force (Census 2011).

	UPhongolo Local Municipality	Jozini Local Municipality	The Big Five False Bay Local Municipality	Mtubatuba Local Municipality	Mbonambi Local Municipality	uMhlathuze Local Municipality
Description	**Number**	**Number**	**Number**	**Number**	**Number**	**Number**
Population	144,573	217,005	36,853	49,189	123,984	348,142
Economically active	59,302	81,591	17,903	27,581	56,789	188,400
Formal and informal (Total)	21,037	19,455	6,489	17,560	19,773	88,328

Formal	16,869	14,922	4,836	14,003	14,562	69,235
Formal - Highly skilled	3,168	2,936	831	2,868	1,770	12,441
Formal - Skilled	6,129	6,329	2,136	5,868	5,704	29,385
Formal - Semi- and unskilled	7,572	5,657	1,869	5,268	7,087	27,409
Informal	4,168	4,533	1,652	3,556	5,211	19,093
Unemployed	7,872	8,546	1,020	1,532	6,138	17,754
Unemployment rate (%)	27.2	30.5	13.6	8.0	23.7	16.7
Labour force participation rate (%)	35.5	23.8	36.2	63.7	34.8	46.9

Table 17 describes the labour force of the LMs in KwaZulu-Natal that will be directly affected by the proposed rail link. According to the 2011 data acquired from the Quantec database the LMs have a varying rate of employment. The unemployment rate varies between 8% and 30% for the Mtubutuba LM and Jozini LM respectively. This is accompanied by a labour force participation rate ranging between 24% and 64% for the same extreme LMs.

Although this data is regarded as a good representation of the actual situation, the size of the informal sector, which includes subsistence agriculture (highly applicable in the municipal areas), is difficult to establish with a reasonable degree of accuracy and can easily be under-estimated. One reason for this is that people involved in informal activity often classify themselves as unemployed.

Obtaining the participation rates, involves calculating the labour force or the economically active population relative to the potential labour force, (i.e. the population in the age group 15 to 64 years). These rates reflect the percentages of the said population that are actually economically active.

The following figures describe each of the most important elements over time. This is done to establish patterns in the Labour force and to assess any changes that might have taken place.

The economic active population includes the formally employed, the unemployed, and those persons active in the informal/ unregistered sector. The terms ‘supply of labour’ and the ‘labour force’ are used as synonyms for the economically active population.

The number of people in the economically active population is highly dependent on the population age distribution. The percentage of the population that is economically active range between approximately 40% to 50%.

The population employed in the formal sector exceeds the informal sector employment and the unemployed population. Employment rates are highly influenced by the regional and national economic climate, and during economic hardship the formal sector employment tend to decrease. This usually lead to an increase in unemployment, but also often an increase in informal sector employment as people who lose their jobs undertake entrepreneuring ventures.

Labour force participation rate indicates the labour force (economically active population) as a percentage of the population in the age group 15– 64 years.

An increase in the participation rate can be the result of more women entering the labour market or the outflow of the potential economically active people from a municipal area due to harsh economic conditions, which would ‘artificially’ increase the participation rate. A low participation rate in a municipal area can be ascribed to the large number of male migrant workers moving out of the municipal area or the proliferation of peripheral activities in the

municipal area. The latter does seem to be the case for some of the LMs, especially those close to the borders of the neighbouring countries.

Employment productivity

Employment is always a priority for local government and it is obvious that development and growth strategies will have to support job creation.

Table 18 shows the employment per sector. The structure of employment and the extent of the link between employment and the level of economic activity is important.

Table 18: Employment per sector (KwaZulu-Natal Local Municipalities)

		Agriculture [SIC: 1]	Mining [SIC: 2]	Manufacturing [SIC: 3]	Utilities [SIC: 4]	Construction [SIC: 5]	Trade [SIC: 6]	Transport [SIC: 7]	Business services [SIC: 8]	Community services [SIC: 92, 95-6, 99, 0]	General government [SIC: 91, 94]	Total
uPhongolo	1996	15,900	625	1,339	82	1,089	2,477	552	674	1,403	1,512	25,654
	2001	13,249	252	1,343	124	876	2,528	511	921	2,153	1,968	23,927
	2006	8,816	143	1,595	103	1,422	2,980	564	1,029	3,095	2,976	22,724
	2011	2,834	221	1,587	67	1,916	3,099	709	1,131	4,057	5,415	21,037
	Avg. Change	-4.8%	-3.6%	1.4%	-0.9%	4.2%	1.5%	1.9%	5.1%	12.0%	17.0%	-1.0%
Jozini	1996	2,720	871	433	19	980	1,917	376	765	2,235	2,194	12,509
	2001	2,112	123	259	24	585	1,927	380	994	2,997	2,443	11,844
	2006	2,523	80	698	16	677	3,507	622	1,206	3,563	2,991	15,882
	2011	1,277	155	1,244	7	762	5,158	1,046	1,436	4,072	4,300	19,455
	Avg. Change	-3.2%	-4.9%	9.8%	-3.8%	-1.6%	9.7%	11.1%	6.3%	5.1%	6.3%	3.2%
Big Five	1996	3,757	13	183	5	306	735	310	129	358	435	6,230
	2001	2,069	13	220	30	371	944	266	316	609	613	5,451
	2006	1,866	9	426	30	291	1,726	156	265	718	745	6,232
	2011	782	14	552	26	233	2,686	117	213	805	1,062	6,489
	Avg. Change	-4.8%	2.0%	13.1%	97.5%	-0.9%	16.6%	-3.6%	8.1%	8.6%	10.3%	0.1%
Mtubatuba	1996	5,393	53	1,152	14	516	1,423	307	507	1,112	1,739	12,216
	2001	3,676	53	983	24	472	2,016	273	943	1,617	2,100	12,158
	2006	3,743	53	1,506	22	717	3,089	378	1,037	2,139	2,862	15,546
	2011	1,586	99	1,912	15	921	4,045	565	1,152	2,615	4,650	17,560
	Avg. Change	-4.3%	8.6%	3.9%	0.7%	4.7%	12.2%	5.1%	10.9%	8.4%	10.9%	2.4%
Mbonambi	1996	8,193	1,152	2,195	27	2,144	2,470	1,084	765	1,386	640	20,056
	2001	7,324	521	1,625	30	1,055	2,215	784	1,024	2,360	944	17,882
	2006	5,917	457	2,821	47	1,360	3,534	1,187	1,421	2,089	899	19,733
	2011	2,045	831	3,917	48	1,667	4,762	1,934	1,724	1,926	920	19,773
	Avg. Change	-4.5%	-1.3%	4.3%	3.6%	-1.8%	5.0%	4.3%	8.6%	3.4%	4.1%	-0.2%

uMhlathuze	1996	8,902	3,931	9,706	214	7,091	12,856	5,618	7,432	10,664	9,600	76,015
	2001	9,041	1,804	12,338	348	6,206	15,868	4,961	10,059	13,592	10,355	84,572
	2006	9,164	1,402	12,046	345	5,773	17,800	4,774	11,269	14,273	11,426	88,272
	2011	3,772	2,600	10,677	274	5,400	17,992	5,415	12,751	15,121	14,326	88,328
	Avg. Change	-3.4%	-1.7%	1.4%	2.0%	-1.4%	2.8%	-0.1%	5.4%	2.6%	3.3%	1.3%

The most noticeable is the differential growth rates in employment creation between the sectors. The agriculture industry has seen a decline in all of the LMs and the industries of the tertiary sector has seen an increase for all 6 of the LMS. The total employment for most of the LMs has also increased with the exception of two (Mbonambi and uPhonglo) that saw a slight decrease. The implication of job losses in the agriculture industry is important since these workers are jobless and have to leave farms. They usually end up in informal settlements on the urban periphery. This lead to a high number of people being affected that subsequently implies a need for about new households to be provided with services. The variation in primary and secondary sector employment and the steady growth in the tertiary sector emphasis the role of the LMs as service centres.

Table 19 shows the employment distribution per sector. These figures are expressed in terms of the distribution of employment across the sectors. It should be noted that the largest economic sectors (GVA contributors) are not necessarily the biggest contributors to employment creation.

Table 19: Employment distribution per sector

	Agriculture [SIC: 1]	Mining [SIC: 2]	Manufacturing [SIC: 3]	Utilities [SIC: 4]	Construction [SIC: 5]	Trade [SIC: 6]	Transport [SIC: 7]	Business services [SIC: 8]	Community services [SIC: 92, 95-6, 99, 0]	General government [SIC: 91, 94]	Total
UPhongolo Local Municipality	13.5%	1.0%	7.5%	0.3%	9.1%	14.7%	3.4%	5.4%	19.3%	25.7%	100.0%
Jozini Local Municipality	6.6%	0.8%	6.4%	0.0%	3.9%	26.5%	5.4%	7.4%	20.9%	22.1%	100.0%
Big Five False Bay Local Municipality	12.0%	0.2%	8.5%	0.4%	3.6%	41.4%	1.8%	3.3%	12.4%	16.4%	100.0%
Mtubatuba Local Municipality	9.0%	0.6%	10.9%	0.1%	5.2%	23.0%	3.2%	6.6%	14.9%	26.5%	100.0%
Mbonambi Local Municipality	10.3%	4.2%	19.8%	0.2%	8.4%	24.1%	9.8%	8.7%	9.7%	4.7%	100.0%
uMhlathuze Local Municipality	4.3%	2.9%	12.1%	0.3%	6.1%	20.4%	6.1%	14.4%	17.1%	16.2%	100.0%

Employment is not a static issue and changes in employment are very important. The figures below provide a comparison between the employment situation in in the respective LMs in 1995 and in 2011.

From the tables the overall decrease in primary sector employment becomes evident. The drastic decrease in agriculture employment can be seen, as well as the decrease in mining and quarrying (with the exception of Mtubutuba LM that saw a very slight (almost constant) increase).

The secondary sector employment is very variable in each of the six LMs. Uphongolo and Mtubutuba saw an increase over each of the secondary sector industries. The other municipalities all saw an increase in manufacturing, but a decrease in the construction sector.

All tertiary sector industries increased in all six of the LMs.

Economic structure and performance

Economic performance of a municipal area's economic system, in terms of factors such as production activity, can be measured by the Gross Value Added (GVA). The analysis will focus on the GVA produced by the primary, secondary and tertiary economic sectors over time; the GVA produced by each LM and compare the GVA of the six LMs.

The **primary sector** of the economy involves changing natural resources into primary products. Most products from this sector are considered raw materials for other industries. Major businesses in this sector normally include agriculture, agribusiness, fishing, forestry and all mining and quarrying industries.

The **secondary sector** generally takes the output of the primary sector and manufactures finished goods or where they are suitable for use by other businesses, for export, or sale to domestic consumers. This sector is often divided into light industry and heavy industry. The sector is made up of manufacturing, electricity, gas and water, and construction.

The **tertiary or services sector** consists of the "soft" parts of the economy, i.e. activities where people offer their knowledge and time to improve productivity, performance, potential, and sustainability. The basic characteristic of this sector is the production of services instead of end products. Businesses in this sector include wholesale and retail trade, catering and accommodation, transport, storage, communication, finance, insurance, real estate, business services, community, social and personal services, and general government.

The table below shows the GVA output per labour sector for each of the LMs over the past 16 years.

Table 20: GVA output per labour unit (R'million)

	UPhongolo Local Municipality			Jozini Local Municipality			The Big Five False Bay Local Municipality			Mtubatuba Local Municipality			Mbonambi Local Municipality			uMhlathuze Local Municipality		
	Primary Sector	Secondary Sector	Tertiary Sector	Primary Sector	Secondary Sector	Tertiary Sector	Primary Sector	Secondary Sector	Tertiary Sector	Primary Sector	Secondary Sector	Tertiary Sector	Primary Sector	Secondary Sector	Tertiary Sector	Primary Sector	Secondary Sector	Tertiary Sector
1995	396	208	409	143	77	472	83	31	124	116	144	339	278	355	430	1095	2278	3864
1996	486	220	436	188	73	497	88	35	140	139	146	370	398	363	442	1603	2881	4120
1997	511	231	452	183	71	506	83	41	153	137	148	389	431	349	448	1722	3150	4274
1998	544	220	473	175	63	527	79	43	167	133	137	419	466	310	451	1773	3276	4484
1999	501	219	499	127	58	542	69	47	183	126	133	446	408	297	464	1410	3607	4695
2000	515	241	532	118	58	568	66	55	200	133	143	482	449	311	483	1430	4173	4958
2001	517	268	575	106	61	600	65	66	217	131	157	521	439	323	515	1432	4375	5233
2002	529	277	615	103	65	641	69	69	232	136	169	561	423	351	557	1358	4644	5488
2003	520	294	663	105	69	698	70	72	245	151	184	610	445	382	609	1435	4660	5774
2004	488	330	707	110	84	749	71	82	250	159	214	660	446	443	658	1411	4738	5978
2005	415	369	774	107	105	834	65	94	262	159	252	736	423	529	738	1274	4935	6348
2006	401	412	841	118	132	919	70	108	272	156	298	815	394	633	816	1179	5133	6671
2007	391	459	928	130	166	1023	75	124	296	165	349	895	387	763	933	1163	5430	7066
2008	386	474	999	144	203	1112	83	139	311	198	385	972	395	887	1027	1122	5461	7338

2009	326	491	1014	150	226	1191	82	140	323	203	399	1026	363	840	1098	1046	4231	7399
2010	345	524	1091	138	265	1243	84	154	352	212	443	1089	394	953	1136	1107	4622	7626
2011	336	562	1187	140	291	1330	84	156	386	216	485	1186	397	993	1226	1131	4900	7938
% Growth Per annum	-0.9	10.1	11.2	-0.1	16.3	10.1	0.1	24.0	12.4	5.0	14.0	14.7	2.5	10.6	10.9	0.19	6.8	6.2

The data presented in the table does not present any correlation between GVA contribution and labour force (i.e. the interplay between labour and capital is not assessed), and therefore it is not possible to draw any specific conclusion regarding labour productivity. It does however provide an indication of the strength of the respective sectors and can be used to predict possible employment opportunities per sector. All other labour units reported an increase in GVA output to labour. If one assumes that these labour units show significant opportunities for substituting labour with capital, then one might conclude that there was an overall increase in labour productivity over the assessment period.

Land use

The Province is characterised by a large number of scattered rural settlements and villages, with a vast number of these settlements and villages occurring within the affected District Municipalities of Zululand, uMkhanyakude and uThungulu.

The presence of villages, informal settlements, and formal urban areas increase towards the coastline with the most significant urban conurbation located within the eThekweni Metropolitan Municpality. Although the majority of urban areas are predominantly located in a southerly location along the coastline and towards the inland, an extensive urban area is however found towards the north at Richards Bay within the uMhlathuze Local Municpality. Richards Bay represents one of the largest secondary activity nodes in the Province.

Richards Bay Port and the Port of Durban together handle approximately 78% of South Africa's cargo tonnage. Richards Bay is also the operational centre for South Africa's aluminium industry while Richards Bay Coal terminal ensures the country's position as the second largest exporter of steam coal in the world.

The following high-level observations can be made:

- The start of the section at Jozini dam;
- Primarily forest, woodland and plantations;
- The only urban/built up areas are at the start and the end at Richards Bay.

5.4 Cultural and Archaeological environment

In the National Heritage Resources Act, no 25 of 1999 (NHRA), Section 2 (vi), it is stated that ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. This is determined in relation to a site or feature's uniqueness, condition of preservation and research potential.

The purpose of this Heritage Impact Assessment (HIA) is to review the current state of cultural heritage resources that occur in the vicinity of the alignment of a new railway line that is planned by Transnet. Preliminary desktop studies have revealed the following facts regarding the Golela to Nsezi alignment area:

5.4.1 Stone Age

From available evidence, it seems that very little habitation of the region took place during the Early Stone Age. This change during the Middle Stone Age and some sites are known to occur to the north of the study area. Although no sites dating to the Later Stone Age are known from the larger region, some very important sites occur in the Ukhahlamba Mountains, Biggersberg and Ngome escarpment. The latter sites are mostly rock shelters that were occupied on and off over a long period of time.

5.4.2 Iron Age

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known sites at Broederstroom south of Hartebeespoort Dam dating to AD 470.

Most information on the region is based on surveys that were done in the Hluhluwe Nature Reserve (Natal Museum Database). Sites dating to all periods, except the Early Iron Age, were identified in the park.

The occupation of the larger geographical area (including the study area) started during the so-called Early Iron Age and is part of the Kalundu Tradition that links with the Kwale sites of Kenya. These early sites occur almost always in the dunes of the coastal forest belt, extanding inland ito the lower-laying savannah areas in the vicinity of rivers - see for example the various maps in Huffman 2007).

During the Late Iron Age settlements seems to move to higher ground further away from rivers. This seems to indicate a defensive position. The latter part of this period was characterised by increased military tension, the reason of which is quite complex but has to do with changing environmental circumstances, population increase, penetration of white settlers into the region and lucrative trade networks with the coast.

5.4.3 Historic period

By 1824 the entire Zululand was under the control of the abaKwazulu, previously a small and insignificant clan. The Bulawayo capital of the Zulu was moved from the Mkubane site and rebuilt on a hilltop overlooking the Mhlatuze River near the present Eshowe / Empangeni road. It was here that Shaka, king of the Zulu, met pioneer Natal settlers Fynn, Farewell and Isaacs.

The Hluhluwe area was originally a royal hunting ground for the Zulu kingdom, but was established as a park in 1895. The Umfolozi and Hluhluwe reserves were established primarily to protect the white rhinoceros, then on the endangered species list.

6 ISSUES IDENTIFIED DURING THE SCOPING PHASE

The proposed construction and upgrade of the Golela to Nsezi border section of the Swaziland Railway Link project is anticipated to impact on a range of biophysical, social and economic aspects of the environment. One of the main purposes of the EIA process is to understand the significance of these potential impacts and to identify suitable mitigation measures, both positive and negative.

A summary of issues raised by both the specialists and the I&APs during the project's Scoping Phase are indicated below. The Plan of Study for the EIA in Appendix B, Annexure J provides a detailed indication of how these issues were addressed during the Impact Assessment Phase. The results of these assessments are detailed in Chapter 8.

The detail contained below has been sourced from the specialist input reports which can be found in Appendix B, annexures A through I.

6.1 Issues Raised by the Specialists

The issues and response report (IRR) containing all the issues raised by the public during the public participation meetings held can be found in Appendix C, Annexure G.

6.1.1 Ecological Issues Raised

Sixty five (65) non-perennial and ten (10) perennial watercourses cross the existing, as well as the proposed 35m wide railway corridors. These watercourses form the basis for identifying potential wetland and riparian areas to be investigated during field surveys. These alignments, including the footprints of access roads, crew camps, borrow pits and refuelling yards, will be extensively surveyed to identify all wetlands and riparian areas within 500m of the proposed activity footprints. Relevant functional and integrity assessments will be conducted based on the findings of the site survey.

All waterbodies that lie within 500m of the proposed development footprints will be investigated during a dedicated field survey as set out in this document. For the purpose of activities within the 1:100 year floodline or the wetland/riparian area (whichever is the greatest), an application for a Water Use License must be made. In addition, activities close to wetlands are excluded from the General Authorization for S21 (c) and (i) water uses (government gazette No. 389) due to the complexity and potentially cumulative impact on a wetlands and rivers and the resources as a whole (DWA, 2010). Therefore all activities within 500m of wetlands or rivers should be subject to an application for authorization.

The Golela to Nsezi line falls within a large number of catchments associated with the following major rivers or lakes:

- Phongola
- Mkuze
- Msunduzi
- Hluhluwe
- St Lucia

- Nyalazi
- Mfolozi
- Nhlabane

All of these systems have been classified as part of the National Freshwater Ecosystem Priority Atlas (NFEPA) project (Nel *et al*., 2012).

The majority of the wetlands within the study area have been shown to be natural, and form part of the important Maputoland Wetland Cluster. However some of these would be considered modified and have a conservation rating score of Z1 or Z2, i.e. low conservation importance. The remaining natural wetland areas associated with the local streams, pans floodplain wetlands, lakes and estuaries were mostly rated as A/B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al*., 2012).

These would then be considered carefully in the EIA phase, firstly to establish their exact form and function through delineation and then determine their Present Ecological State (PES). This would also be a requirement by the Department of Water Affairs should any of the proposed line be within 500m of a wetland boundary thus, construction activity would require a Water Use License Application for a Section 21 c & i use.

During the EIA phase, intensive habitat matching will be conducted and ground-truthed to determine the exact status and importance of the habitats observed at a finer scale as well as identify the presence any Species of Special Concern (Faunal & Floral).

The following issues and impacts have been identified together with potential impacts which will be investigated during the EIA phase:

Issue 1 – Destruction of natural habitat.

- Impact 1 - loss of habitat and removal of vegetation – terrestrial
- Impact 2 - loss of habitat and removal of vegetation – wetland and waterbodies
- Impact 3 - Loss of corridors

Issue 2 – Loss of endangered species

- Impact 1 – Loss of rare and endangered species
- Impact 2 – Introduction of alien and invasive species

Issue 3 – Removal of topsoils and soil erosion

- Impact 1 – an increase in soil erosion

Issue 4 – Introduction of alien vegetation

- Impact 1 – introduction of alien or invasive plants

6.1.2 Geohydrological Issues Raised

The potential for groundwater contamination is associated with uncontrolled spills of fuels and lubricants during the construction phase, as well as any hazardous material transported during the operational phase. The extent and

impact of potential groundwater contamination is largely dependent on the nature of the subsurface soil, geological and geohydrological conditions.

6.1.3 Noise and Vibration issues raised

The noise and vibration scoping assessment indicated that the proposed project could have an impact of significance on the noise climate of the surrounding area as there are noise-sensitive developments within the area of influence of the railway line. The main factor that will determine the potential noise impact is the distance that the noise-generating activities would be from a NSD, the type of activities taking place, the speed of the locomotives, the existing ambient soundscape at receptors dwellings, as well as the likely noise abatement measures to be implemented.

6.1.4 Social, Economic and Cultural/Heritage Issues Raised

Negative Socio-economic Impacts

- A loss of land and assets to the railway servitude or areas to be occupied by project-related surface infrastructure;
- A population influx (due to the presence of a construction and operational workforce, as well as an influx of job-seekers into the area), with a possible concomitant increase in social pathologies and increased pressure on existing infrastructure and services;
- Disruption of access routes and daily movement patterns by the construction and/or permanent servitude;
- Impacts on sense of place. Such impacts may arise as a result of the visual intrusion of project-related infrastructure, as well as noise and traffic impacts during construction
- Dust caused by the construction works and from movement of heavy equipment. During the construction phase, the local community and construction workers would be inconvenienced by the dust generated by the construction works.
- Noise and vibration due to the construction works and from movement of heavy equipment. Movement of heavy machinery on existing local roads may be one of the core problems for the local community during the construction phase. Vibration may also damage structures located nearby.
- Socio-cultural differences and conflicts between migrant workers and the local community. Single men predominately occupy the construction camps which could create social conflicts, usually as a result of cultural differences, alcohol abuse or being away from their wives or girlfriends for extended periods of time. A possible reason for conflict would be the perception among locals that the outsiders are taking up jobs that could have gone to unemployed members of the local community. An influx of unemployed job seekers could also add to the potential for conflict.
- Diseases associated with the arrival of temporary labour in the area. Various social pathologies, such as drug/alcohol misuse, abuse of woman and children and incidences of sexually transmitted diseases (STDs) may increase with the influx of job-seekers into the area.
- Crime. An inflow of construction workers and job seekers may also be accompanied by an increase in crime. Even if specific instances of crime are not as a result of the newcomers, they may still be ascribed to them by local communities.
- Informal settlements. Once construction is concluded and the camp is vacated, it may be illegally occupied by unlawful tenant.

Positive Socio-economic Impacts

- Local employment and job opportunities. The construction phase of the project will have a positive impact on the local labour market. It is anticipated that the operational phase will also create permanent

employment opportunities for the local affected communities though some level of technical skills and qualifications may be needed.

- Local economy opportunities and economic empowerment. The construction phase of the project will have temporary positive impacts on the local economy.
- Establishment/ upgrading of services.

6.1.5 Cultural/Heritage Issues Raised

The cultural and heritage issues foreseen in this project include the following:

- Ignorance as to the importance and value of heritage sites and their protection through legislation. Land and property owners are, in most cases, ignorant about the value of heritage or their legal obligation to protect it. Current legislation is very clear as to the obligation of the land or property owner with regards to heritage management and preservation.
- Ignorance as to the nature and distribution of heritage resources. There is very little information available on heritage in the area. This can be overcome by a number of actions, e.g.
    - A system whereby members of the public can record the heritage sites in their communities or on their properties should be established. This can be achieved, for example by keeping a register at the local library.
    - The municipality and other authorities should make funds available for systematic surveys by which sites can be documented
- Lack of information on heritage resources on the side of the authorities responsible for planning. This is the direct result of the above-mentioned problem. More information is needed.
- Heritage is not static. New heritage sites are continuously being created, due to events that take place, or, simplistically seen, because existing features and structures become older with the passage of time and all should be considered for their contribution to retelling the story of the past. The process of identifying and documenting heritage features would therefore, in theory, never stop.

The specialists have investigated the above mentioned impacts in the EIA - the results of the assessments, description of potential impacts as well as proposed mitigation measures are described in Chapter 8.

6.1.6 Safety and Security Aspects

An emergency response plan should be compiled and incorporated into the EMPs for both the construction and operational phases. Issues pertaining to regular inspections, monitoring mechanisms, maintenance and emergency response will be incorporated into this EMP.

Safety requirements linked to the existing development footprint of the proposed construction site will be investigated and reported in the legislative and institutional requirements of the EIA report. These aspects will further be incorporated into the design and layout of the proposed facility. Where necessary, monitoring and inspection mechanisms will be included in the construction and operational phases of the EMP.

6.2 Issues raised during the Public Participation Process

The following issues in Table 21 constitute an extract from the issues and response report (IRR) and the Minutes captured at the public and focus group meetings for the Golela to Nsezi section of the proposed Swaziland Railway

Link project. The IRR containing all the issues raised by the public during the public participation meetings held can be found in Appendix C, Annexure G and hard copies of the comments are included in Appendix C Annexure K.

Table 21: Issues and Responses

Issue	Response
From Mr David Davidson **Zenith Estates CC:** **With reference to your advertisement in the Zululand Observer of 24/06/2013; we would like to register as an interested and affected party with regards to the Transnet upgrade from Nsezi to Golela.** **We farm on both sides of the rail line north and south of Nseleni rail way station which is of our main concern but some matter will apply no doubt to the whole upgrade.** **Our immediate concerns are:** **1. The level crossings need to be upgraded to guarded level crossings or under / over passes.** **2. The rail lines used to be fenced and with the upgrade the lines need to be re-fenced. We have livestock and we are thus unable to safely graze stock near the rail lines. As mentioned we have farm land on both sides of the "track." Fencing is a safety issue as it ensures staff and livestock can only cross over the lines at recognized crossings. Just because the fences allegedly get stolen Transnet and their predecessors have not even repaired fences as a result with 20 years of no fence repairs there are now no fences. What was not stolen has all rusted away. If the fencing is stolen a method of construction that prevents theft needs to be used. For example old concrete rail way sleepers can be used as fence posts and fencing wire can be electrified.** **3. Noise levels need to be addressed. Prior to 1972 we had steam trains. These then changed to diesel electric, with bigger noise and bigger hooters Recently there has been another**	Mr Davidson is included on the database as a representative of the Kwambonambi Farmers Association and member of Zenith Estates CC. 1. As the safe crossing of a railway line is a significant issue this was included as one of the design criteria considered during the pre-feasibility study. The following is an extract from the FEL-2 Pre-feasibility Report prepared for Transnet by Mott MacDonald Railway & Civil Engineering Consultants. *' **Level Crossings*** *The use of level crossings for public roads will be kept to an absolute minimum for the 100 wagon system.* *No level crossings will be permitted for the 200 wagon system.* *For non-public roads, if possible or practical, no level crossings are provided, except for maintenance road crossings.* *All public roads crossings will be designed as grade separation structures. Where grade separation structures are not feasible, road deviations or relocations will be considered as alternatives.* *Operational designs [signage] will be provided in terms of the document '"SA Road Traffic Signs Manual, Chapter 7, Signing of* Railway Crossings" or other ruling documentation.' 2.Transnet will put necessary security measures in place in the form of fencing and gates where required with appropriate access control to affected farmers. 3. Refer to **Appendix B** for a copy of the Noise Scoping which has been conducted. The assessment indicated that the proposed project could have an impact of significance on the noise climate of the surrounding area as there are Noise-Sensitive Developments [NSD] within the area of

locomotive upgrade. They seem to have gotten more noisy and have even bigger hooters. We live approximately 150 m off the main line and at times our houses shake and the windows rattle with the noise of a locomotive accelerating-we do believe the noise level of 80 dB is exceeded - in a normal health and safety situation one should be wearing ear protection. However this is Transnet and they have never had any regard for noise levels around our homes. For example last year some train driver found humour in blasting his hooter solidly. Our concern is bigger trains = more noise. More Trains = more noise more often. Remedial action could involve the cladding of the diesel engine compartments, better sound baffling exhausts, electrifying the line to use electric trains or using vegetation and structures (earthen banks or a " precast" wall of old concrete rail sleepers side by side) to reduce sound projection onto residential areas. On the hooter side a dual system could be used - the initial blast is reduced in volume and say after 3 seconds this automatically becomes VERY loud.	influence of the railway line. The main factor that will determine the potential noise impact is the distance that the noise-generating activities would be from a NSD, the type of activities taking place, the speed of the locomotives, the existing ambient soundscape at receptors dwellings, as well as the likely noise abatement measures to be implemented. An Environmental Noise Impact Assessment will be conducted in order to determine the significance of the identified impacts and to investigate and recommend mitigation measures to reduce the impacts.
4. Transnet need to become members of the local Fire Association; this is a legal requirement but Transnet regard themselves above the law in this issue.	4. The concern regarding fire protection is a significant issue which has been raised by various affected parties. Firebreaks and protection will be taken up in the Environmental Management Programme (EMP). Transnet will ensure the identification and implementation of measures to adequately address the risk of uncontrolled fires.
5. Transnet need to have a system of addressing concerns. For example: If the brakes bind on a rail truck and the molten metal coming off these brakes sets fire to the surrounding farms there is no one to contact. So how do we stop the train to stop the spreading fires? Or if a scrap dealer is seen cutting up rail lines - who do we contact? (As what happened last night on 23/06/2013 - a suspect was seen; by local community members; using a	5. A complaints procedure will be developed for the construction and operational phases to ensure effective response times. In this regard, a suitable person(s) will be identified with whom the public can raise concerns/complaints and contact details will be made available.

cutting torch to cut up rail lines in the Mposa Station area -So who do we call. Transnet does not have contact details so the theft cannot be addressed.) Point 5 may appear to be out of the scope of this EIA, but if Transnet cannot address current problems they should not be allowed to upgrade. . We would like to see a system in place much like the ESKOM toll free number. The call centre could then asses the urgency of a matter. We do battle with internet connection so it would be appreciated that replies and documents be kept to under 5 Mb. Alternatively they should be posted.	
As representative of the Pongola Game Reserve Landowners Association mandated to deal with Elephant and Black Rhino Management Issues, I herewith submit my notice as an interested and affected party with the above planned railway upgrade project. **The line to be upgraded from Golela to Nsezi runs for +- 30 km through the Phongolo Nature Reserve (EKZNW) and Pongola Private Game Reserve, and therefore falls within the above project.** **Wildlife mortalities from the train are always been a big concern and all efforts and methods to reduce these to the bare minimum is our prime objective in our co-operation with Transnet.** **Herewith following is a list of concerns that we would like to be addressed;** **1. Speed of locomotives travelling through the reserve – This problem has improved following the implementation of a speed limit after the death of two Black Rhino in 2008 and 2009. How is the expected increase in rail traffic going to effect the current speed limit**	Dr Heinz Kohrs as representative of the Pongola Game Reserve has been registered as an affected stakeholder and will be notified once the Draft /Final Scoping and Draft/Final EIA Reports become available for review and comment by I&Aps. Furthermore Dr Kohrs will receive notification of stakeholder meetings. A response to the items raised are included below in the same numerical order. 1. The impact of increased rail traffic on wildlife is a significant issue which will require effective mitigating measures by Transnet. Proposals must be determined by Transnet in collaboration with the design engineering team and in particular also the scheduling team. The matter will be investigated further and mitigating measures will be included in the Draft EIA Report. 2. The envisaged schedule amounts to 12 to 24 trains per day per direction; this will necessitate night time travel. 3. Hooting limitations will be addressed in the operational manual and the construction Environmental Management Programme; 4. The use of such a deterrent will be considered in collaboration with Transnet; 5. This issue will be further considered in collaboration with Transnet; 6. This issue will be investigated during the EIA phase and feasible mitigation measures that ensure the protection of

restriction? This is critical for all the wildlife, and not only the Black Rhino. **2. The increase in train traffic – how can this be kept to the bare essential? Day vs night traffic?** **3. Hooting – to be kept to the bare minimum.** **4. High frequency warning signal on the locomotive – Is it possible to equip every locomotive with a high frequency warning signal devise that will warn all wildlife on or near the railway line of the oncoming locomotive? Apparently such a warning device has been deployed in other countries to deter wildlife out of the way of the approaching trains.** **5. Head lights of the locomotive – can one please consider a head light that does not blind the animals on and near the line?** **6. Protecting the cuttings – from past experience, and particularly White Rhino, tend to wander along the railway line into the cutting section where they are trapped from getting out of the way from approaching trains. Transnet has put at each entrance to the cuttings a packed pile of concrete railway sleepers as an obstacle for wildlife to wander into this cutting 'trap'. With the new upgrade a more effective blockade could be found and implemented to stop large animals like elephant and rhino from wandering into the railway line cutting areas.** **7. Tortoises and Rock Pythons – Many of these get killed by the train when crossing the railway line. With the upgrade, please look into creating more subways for these reptiles.** **8. Bush Clearing – It is essential that on either sides of the railway line the Transnet area is kept clear of any bushes and trees for at least 10 metres. This will prevent browsers and other wildlife lurking close to the line and when startled by the sudden approach of the train, run onto the line in front of the train or into the coaches.**	affected species at key points will be set for incorporation in design and implementation during construction and operation. 7. Proposals for the frequency of subways will be investigated and included in the EIA Report; 8. Noted. The comment will be considered for inclusion in the Environmental Management Programme (EMP); 9. This issue will be addressed in the EMP; 10. Noted this issue will be addressed in the EMP; 11. Noted. This issue will be addressed in the EMP. 12. This provision can be included in the EMP. • additional land may be required where the upgrades extend beyond the existing servitudes. • Measures for the protection of existing fences during construction will be investigated in the EIA and specified in the EMP • The impact of the required water usage during the construction phase will be investigated as part of the EIA Phase and during the application for a Water Use License. • A land use map will be included in the Draft EIA Report. • Flora and wetland assessments will be conducted as part of the EIA Phase and recommendations will be included in the EMP. • A geotechnical evaluation has been conducted and the findings will be included in the EIAR.

9. Littering – This is a big problem especially by the contractor teams working and maintaining the railway line. With more contractors working on this project in the reserve, littering on the entrance roads and work site will escalate. This is unacceptable! **10. Security – PPGR are custodians to the WWF Black Rhino Range Expansion Project, and security is critical in the prevention of rhino poaching. All entrance gates in and out of the reserve are manned for security reasons. Contractors entering the reserve must follow our security and gate control protocols to assist with our efforts of preventing and controlling rhino poaching.** **11. Fires – no fires of any kind may be made in the reserve by contractors. A veld fire can devastate the reserve and its wildlife.** **12. Road usage – Please respect the 35 km speed limit. Also, after heavy rains, no heavy vehicle and machinery may be deployed as it damages our reserve roads that are not all weather surfaced.** **• Will additional land be required?** **• All farms next to railway line have game. Concern regarding damage to fences of adjacent properties during construction;** **• Consideration of poor natural water quantities. Impact of Transnet water usage during construction activities must be investigated** **• The Department acknowledge the receipt of the invitation to participate . In view of the document dated 2 July 2013, this office is concerned that the proposed activity will cover a huge area comprising different facets of natural resources (Soils, watercourses, vegetation etc.) falling under different Agricultural Land Categories which may be negatively impacted.** **• Therefore this office requests that the following aspects and studies form part**	

of the Environmental Impact Assessment: • **Current land use, zoning, extent of the proposed areas for development;** • **Geotechnical survey;** • **Flora studies** • **Wetland studies** **All the above should form part of the Environmental Management Plan (EMP) and all the stipulations related to responsibilities and conditions therein must be strictly adhered to.**	
The railway line is being upgraded however I am unable to send my timber to Umkomaas as there are no trucks. Transnet is looking at a massive export picture yet there is no local infrastructure, therefore no benefits for the locals	The comment has been sent to the Rail planning team for confirmation on how SMME's will be supported Local communities can benefit from job opportunities during the construction and operational phases. The upgrade of certain sections such as Davel to Lothair in Mpumalanga includes local wood and other general freight.
Will impact of this project on existing rail traffic be considered? **Richards Bay Minerals currently moves about two million tons of product on that rail line. Any disruption to this activity will result in economic impacts.** **Will increased traffic on new rail line have an impact on existing traffic.**	No impact on current operations as line between Golela and Nsezi will be constructed parallel to the existing line within the existing servitude. Therefore it will be operations as normal on the existing line. Apart from its strategic value the link line is constructed primarily for the purpose of re-routing general freight traffic from the Coal line and by so doing freeing up capacity for the export of coal. Traffic impacts will be considered by the engineers.

6.3 Institutional and Legal Aspects Raised During the Scoping Phase

6.3.1 Project Lifecycle

The project is effectively in the preliminary design phase, and no detailed design is available as such. Where applicable comment and suggestions made during the scoping phase will be incorporated into the design.

6.3.2 Alternatives to and Need for the Project

A detailed alternatives assessment will be conducted in the EIA phase, based on alternatives identified during the Scoping Phase (Chapter 1.7). These alternatives include evaluation of the no-go option; alternatives to site

selection; and alternatives to construction methodologies and site layout. The need for the project will be evaluated and presented in the EIA report.

6.3.3 Availability of Specialist Reports and Information Relevant to the Application

All documentation relevant to this environmental application, particularly specialist reports and background information used to compile the draft EIR will be appended to the final reports and made available during the required comment periods.

6.4 Consultation with the Competent Authorities

Consultations with the authorities will occur on the following occasion:-

- After the Draft EIA report has been made available for comment within the public domain, comments will be incorporated into the Issues and Response Report and Final EIA Report for submission to DEA.
- The Final EIA Report will once again be made available for comment within the public domain.
- A second site visit and meeting with DEA is proposed once the Final EIA report is in its commenting period.
- Any final comments will be incorporated into the Final EIA for submission to DEA.
- Apart from the above mentioned occasions, further consultation with authorities will occur whenever necessary.

7 ASSESSMENT METHODOLOGY

The purpose of this chapter is to describe the assessment methodology utilised in determining the significance of the potential impacts of the proposed activities on the biophysical, social and economic environment. The methodology was developed in 1995 and has been continually refined to date through the application of it to over 400 EIA processes. The methodology is broadly consistent to that described in the DEA's Guideline Document on the EIA Regulations (1998).

7.1.1 Evaluation Methods in Environmental Assessments

7.1.1.1 Identification of environmental, social and economic attributes

Environmental, social and economic attributes are first identified for which impacts of the proposed activity will be assessed. This is done through initial investigations by the EAP and then through public participation.

7.1.1.2 Collection of data and description of status quo situation

Baseline information is then required to establish the *status quo* for the environmental and social attributes to be evaluated in the impact assessment. This is done through collection and collation of existing spatial information (GIS, aerial photographs, planning databases etc.) which is then verified through specialist assessments.

7.1.1.3 Identification of environmental, social and economic impacts

The impact of activities to be conducted during various phases of the proposed project on the attributes identified during scoping phase EIA is then evaluated by the EAP through input from the various specialists. The preferred methodology to evaluation is a simple Impact – Activity Checklist.

7.1.1.4 Impact – Activity Checklist

This section outlines the methodology used to assess the significance of the potential environmental impacts identified. For each impact, the EXTENT (spatial scale), INTENSITY (size or degree scale) and DURATION (time scale) are described (Table 22). These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described in the EIR represent the full range of plausible and pragmatic measures *but does not necessarily imply that they should or will all be implemented*. The decision as to which mitigation measures to implement lies with Transnet and ultimately with the DEA. The tables on the following pages show the scale used to assess these variables, and defines each of the rating categories.

Table 22: Criteria for the evaluation of environmental impacts

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**Regional**	Beyond a 10km radius of the proposed construction site
	Local	Within a 10km radius of the centre of the proposed construction site
	Site specific	On site or within 100m of the proposed construction site
Intensity of impact (at the indicated spatial scale)	**High**	Natural and/ or social functions and/ or processes are *severely* altered
	Medium	Natural and/ or social functions and/ or processes are *notably* altered
	Low	Natural and/ or social functions and/ or processes are *slightly* altered
	Very Low	Natural and/ or social functions and/ or processes are *negligibly* altered
	Zero	Natural and/ or social functions and/ or processes remain *unaltered*
Duration of impact	**Construction period**	Up to 2 years
	Medium Term	Up to 5 years after construction
	Long Term	More than 5 years after construction

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and intensity. The means of arriving at the different significance ratings is explained in the table below.

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Table 23: Definition of significance ratings

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	• High intensity with a regional extent and long term duration • High intensity with either a regional extent and medium term duration or a local extent and long term duration • Medium intensity with a regional extent and long term duration
Medium	• High intensity with a local extent and medium term duration • High intensity with a regional extent and construction period or a site specific extent and long term duration • High intensity with either a local extent and construction period duration or a site specific extent and medium term duration • Medium intensity with any combination of extent and duration except site specific and construction period or regional and long term • Low intensity with a regional extent and long term duration
Low	• High intensity with a site specific extent and construction period duration • Medium intensity with a site specific extent and construction period duration • Low intensity with any combination of extent and duration except site specific and construction period or regional and long term • Very low intensity with a regional extent and long term duration
Very low	• Low intensity with a site specific extent and construction period duration • Very low intensity with any combination of extent and duration except regional and long term
Neutral	• Zero intensity with any combination of extent and duration

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact would be determined using the rating systems outlined in Table 24 and Table 25 respectively. It is important to note that the significance of an impact should always be considered in connection with the probability of that impact occurring. Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in Table 26.

Table 24: Definition of probability ratings

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95% chance of the impact occurring.
Probable	Estimated 5 to 95% chance of the impact occurring.
Unlikely	Estimated less than 5% chance of the impact occurring.

Table 25: Definition of confidence ratings

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 26: Definition of reversibility ratings

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is permanent.
Reversible	The impact is reversible, within a period of 10 years.

7.1.2 Subjectivity in Assigning Significance

Despite attempts at providing a completely objective and impartial assessment of the environmental implications of development activities, EIA processes can never escape the subjectivity inherent in attempting to define significance. The determination of the significance of an impact depends on both the context (spatial scale and temporal duration) and intensity of that impact. Since the rationalisation of context and intensity will ultimately be prejudiced by the observer, there can be no wholly objective measure by which to judge the components of significance, let alone how they are integrated into a single comparable measure.

This notwithstanding, in order to facilitate informed decision-making, EIAs must endeavour to come to terms with the significance of the potential environmental impacts associated with particular development activities. Recognising this, we have attempted to address potential subjectivity in the current EIA process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above;
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail in the PoSfEIA and in this EIR. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing towards the determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the EIR with a clear summary of how the assessor derived the assigned significance;
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties; and
- Utilising a team approach and internal review of the assessment to facilitate a more rigorous and defendable system.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

7.1.3 Consideration of cumulative impacts

Section 2 of the NEMA requires the consideration of cumulative impacts as part of any environmental assessment process. EIAs have traditionally, however, failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires co-ordinated institutional arrangements; and
- EIA's are typically carried out on specific developments, whereas cumulative impacts result from broader biophysical, social and economic considerations, which typically cannot be addressed at the project level.

8 ASSESSMENT OF POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

8.1 Introduction

This chapter describes the potential impacts on the biophysical and social environments, which may occur due to the issues identified in Chapter 6.

The potential impacts identified during the Scoping Phase of this project as assessed in detail in this report. The significance of the impact determined in the following sections of this chapter is detailed as well. The methodology used to assess the potential impacts is detailed in Chapter 7 of this report. The terms pre-mitigation and post-mitigation refer to the impact a certain aspect might have before mitigation measures have been implemented, as well as the impact of such aspect after mitigation measures have been implemented. **Note that this does not imply that mitigation should or would be undertaken, but merely indicates the extent to which mitigation could change the significance of the impact where it is to be implemented.**

As such, certain mitigation measures proposed by the specialists and contained in their respective specialist reports are not feasible to implement due to various reasons. Where such mitigation measures are proposed, the EAP has indicated such on the impact description table. Reasons are also given for why they are viewed as unfeasible. These mitigation measures will thus NOT be included in the EMP.

8.2 Impacts on the Biophysical Environment

8.2.1 Ecological assessment

Dr Brian Colloty from Scherman Colloty and Associates conducted the ecological and aquatic specialist assessments for the project. The specialist report can be found in Appendix B, Annexure A.

The following general methods were used in assessing the study area, which included the 35m wide footprint of the proposed rail line area and 500m zone either side of the alignment with regards to wetlands:

Flora:

- Provide a description of the general floristic species diversity and community composition;
- Evaluating the occurrence of potential Red Data taxa;
- Demarcating physiognomic units based on floristic relevès; and
- Provide an indication on the ecological condition (successional stage) of the predetermined physiognomic units.

Fauna:

- A detailed faunal assessment based on field observation;
- An avifaunal assessment with particular reference towards the occurrence species sensitive to the placement of transmission lines;
- An evaluation of the occurrence of any of the listed conservation needy species.

Wetlands and rivers:

A large proportion of the available habitat related to sensitive or important taxa are associated with the wetland / riverine / moist habitats. The EIA phase thus focused on critical assessment of the wetland / riverine systems in the following way:

- Delineation of any important wetland and river boundaries using the requisite techniques based upon the latest Wetland Classification systems (SANBI, 2009);
- Indicate suitable buffer zones as prescribed by the relevant provincial policies / conservation plans;
- Assess the status of the observed faunal and floral populations observed; and
- Assess the potential impacts on the functioning of these systems.

8.2.1.1 Terrestrial habitats

The study area is dominated by a mixture of urban and rural development, forestry, and various forms of agriculture, with the associated infrastructure such as roads, lakes dams and the present rail network, while traversing a wide variety habitat that range from drier Bushveld in the north to more mesic (moist) coastal forests in the south.

Figure 14: Typical landscape within the northern portion of the study area near Pongola

Figure 15: The agricultural landscape that dominates the area between Mkuse and Hluhluwe

Figure 16: Typical drainage lines with Fever Trees (Acacia xanthophloea) found within the northern half of the rail line

As explained in Chapter 5, Mucina and Rutherford (2006) describe five regional vegetation types for the area. The Biodiversity Act (No 10 of 2004) (Amendment December 2011), lists 225 threatened ecosystems based on vegetation type (Vegmap). None of these vegetation types are listed by this Act.

KwaZulu-Natal Vegetation Map:

The KZN Vegetation Map (Scott-Shaw and Escott, 2011) is a refinement of the South African Vegetation Map (Mucina and Rutherford, 2006) (Figure 17). The majority of the vegetation units intersecting the railway are ''Threatened'' and classified as either Critically Endangered or Vulnerable (Table 27). However it was confirmed during the site investigations that the rail servitude that presently exist and where the development will take place is largely degraded or transformed, with the exception of several of the river crossings.

Figure 17: The KZN Vegetation Map (Scott-Shaw and Escott, 2011)

Table 27: Vegetation along the railway alignment with associated Ecosystem Status and Biome, within the KZN Province

Vegetation Name	Ecosystem Status	Biome
Alluvial Wetlands : Subtropical Alluvial Vegetation	Endangered	Wetland
Alluvial Wetlands : Subtropical Alluvial Vegetation : Lowveld Floodplain Grasslands	Critically Endangered	Wetland
Alluvial Wetlands : Subtropical Alluvial Vegetation : Lowveld Floodplain Grasslands : Tall Reed Wetland	Vulnerable	Wetland
Freshwater Wetlands : Subtropical Freshwater Wetlands	Vulnerable	Wetland
Freshwater Wetlands : Subtropical Freshwater Wetlands : Coastal Lakes & Pans	Least Threatened	Wetland
Freshwater Wetlands : Subtropical Freshwater Wetlands : Short Grass/ Sedge Wetlands	Least Threatened	Wetland
Freshwater Wetlands : Subtropical Freshwater Wetlands : Short Grass/ Sedge Wetlands	Least Threatened	Wetland
KwaZulu-Natal Coastal Forests : Maputaland Moist Coastal Lowlands Forest	Endangered	Forest
Lowveld Riverine Forest	Critically Endangered	Azonal Forest
Makatini Clay Thicket	Least Threatened	Savanna
Maputaland Coastal Belt	Endangered	Indian Ocean Coastal Belt
Maputaland Wooded Grassland	Endangered	Indian Ocean Coastal Belt
Swamp Forests : *Ficus trichopoda* Swamp Forest	Critically Endangered	Azonal Forest
Swamp Forests : *Voacanga thouarsii* Swamp Forest	Critically Endangered	Azonal Forest
Tembe Sandy Bushveld	Least Threatened	Savanna
Western Maputaland Clay Bushveld	Vulnerable	Savanna
Zululand Coastal Thornveld	Critically Endangered	Savanna
Zululand Lowveld	Vulnerable	Savanna

The following species were observed during the survey:

Species	Common Name	Conservation Status
Solanum spp		-
Themeda triandra	Rooigras	-
Aristida junciformis	Ngongoni three awn	-
Plantago lanceolata	Ribwort	-
Senecio spp	-	-
Hyparrhenia hirta	Common Thatching Grass	-
Cymbopogon plurinodes	Narrow-leaved turpentine grass	-

Digitaria eriantha	Finger grass	-
Acacia mearnsii	Black wattle	-
Eucalyptus spp	Gum	-
Aloe greatheadii	Spotted Aloe	-
Cynodon dactylon	Kweek	-
Imperata cylindrica	Cottonwool grass	-
Bulbostylis schoenoides	Sedge	-
Schoenoplectus spp		
Pteridium aquilinum	Bracken fern	-
Senna didimobtyra	Peanut-butter Bush	-
Pisdium guava	Guava	-
Strelitzia caudata	Wild banana	-
Ehrythrina lysistemons	Common Coral Tree	-
Cussonia zuluensis	Kiepersol	-
Rhoicissus tridentate	Wild grape	-
Vepris lanceolata	Ironwood	-
Searsia chirindensis	Red currant	-
Ptaeroxylon obliquum	Sneezewood	-
Euphorbia triangularis	River euphorbia	-
Hypaene coriacea	Lala palm	-
Ficus abutifolia	Large leave rock fig	-
Sclerocarya birrea	Marula	-
Acacia xantholopea	Fever tree	
Lantana camara	Lantana	
Birds		
Vanellus armatus	Blacksmith lapwing	-
Bostrychia hagedash	Hadeda ibis	-
Motacilla capensis	Cape Wagtail	-
Bubulcus ibis	Western cattle egret	-
Corvus capensis	Cape Crow	-
Ardea melanocephala	Black-headed heron	-
Lanius collaris	Common Fiscal Shrike	-
Scopus umbretta	Hamerkop	-

The plant and animal species observed were mostly associated with the intact riverine valleys, small wetland areas and forest pockets. This is due to the degradation found within the remaining areas which had been converted to agricultural areas or had reverted to secondary grasslands areas. The most important habitats, with the highest diversity and largely intact were associated with the small forest and riverine/drainage line areas and for this study would be rated as highly sensitive.

8.2.1.1.1 Terrestrial environment impact assessment – Loss of habitat and removal of vegetation

Nature of the impact

Due to the nature of the project, vegetation will be cleared and replaced with rail infrastructure, service roads and stormwater management systems. This will have the greatest impact in areas where no lines are in place and within the areas earmarked as biodiversity hotspots and associated with the small remaining Coastal forest areas.

Significance of impacts without mitigation

The construction phase would have the greatest impact on the surrounding vegetation. This will definitely result in the disturbance of the vegetation and soils within the site especially when considering the linear aspects of the project such as the rail lines and ancillary works mentioned above. Due to the site scale of disturbance in the construction period on the surrounding vegetation when compared to its current state, i.e. the magnitude would be Medium, the overall significance of would be rated as High without mitigation (Table 28).

The operational phase of the project would have limited impact on the surrounding vegetation once the plants are allowed to re-establish themselves in any remaining areas; thus the overall intensity would remain be Very Low as the species assemblages would have altered from natural. It is also anticipated that the grazing and agricultural pressure on the vegetation would also continue but would be equitable to the present state and thus similar to the No-Go option.

The table below indicates the impact description as well as mitigation measures proposed.

Table 28: Impact description for the loss of habitat and removal of vegetation in the terrestrial habitat

IMPACT DESCRIPTION: Loss of habitat and removal of vegetation - terrestrial				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Equal to the duration of the construction phase	Consequence: Slightly detrimental	Significance: Moderate - negative
Extent	Site-specific	Will result in the disturbance of the vegetation and soils within the sites		
Intensity	High - negative	Due to the site scale of disturbance in the construction period on the surrounding vegetation when compared to its current state, i.e. the intensity would be low		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation		
MITIGATION: • Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum and the floodplain / wetlands habitats identified should be retained within the development footprint in its current state. • Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation • A search and rescue operation for both plants and fauna (particularly reptiles) must be initiated prior to the commencement of any construction once the required permits are in place. • Re-vegetation as part of a rehabilitation plan is always advocated, however due the nature of the vegetation, this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas. • Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	As for pre-mitigation		
Intensity	Moderate - negative	Mitigation will reduce the negative impact		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation but will be reduced through appropriate mitigation measures		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the new Golela to Nsezi line will be constructed adjacent to the existing line, 15m either side of the centre line will not allow the contractors sufficient space to carry out construction activities. Therefore the EAP proposes the following as included in the EMP that **the width of the construction footprint must be agreed upon by the ECO and the Engineer and as far as possible must be kept to a minimum. The maximum width of the construction footprint servitude will not exceed 75m. Should additional space be needed for the temporary storage of material, the ECO must advise on an appropriate area away from any sensitive areas**.

8.2.1.2 Aquatic habitats

As described in Chapter 5, the proposed Golela to Nsezi line falls within a large number of catchments associated with the following major rivers or lakes:

- Phongola
- Mkuze
- Msunduzi
- Hluhluwe
- St Lucia
- Nyalazi
- Mfolozi
- Nhlabane

All of these systems have been classified as part of the National Freshwater Ecosystem Priority Atlas (NFEPA) project (Nel *et al*., 2012).

The majority of the wetlands within the study area have been shown to be natural, and form part of the important Maputoland Wetland Cluster. However some of these would be considered modified and have a conservation rating score of Z1 or Z2, i.e. low conservation importance. The remaining natural wetland areas associated with the local streams, pans floodplain wetlands, lakes and estuaries were mostly rated as A/B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al*., 2012).

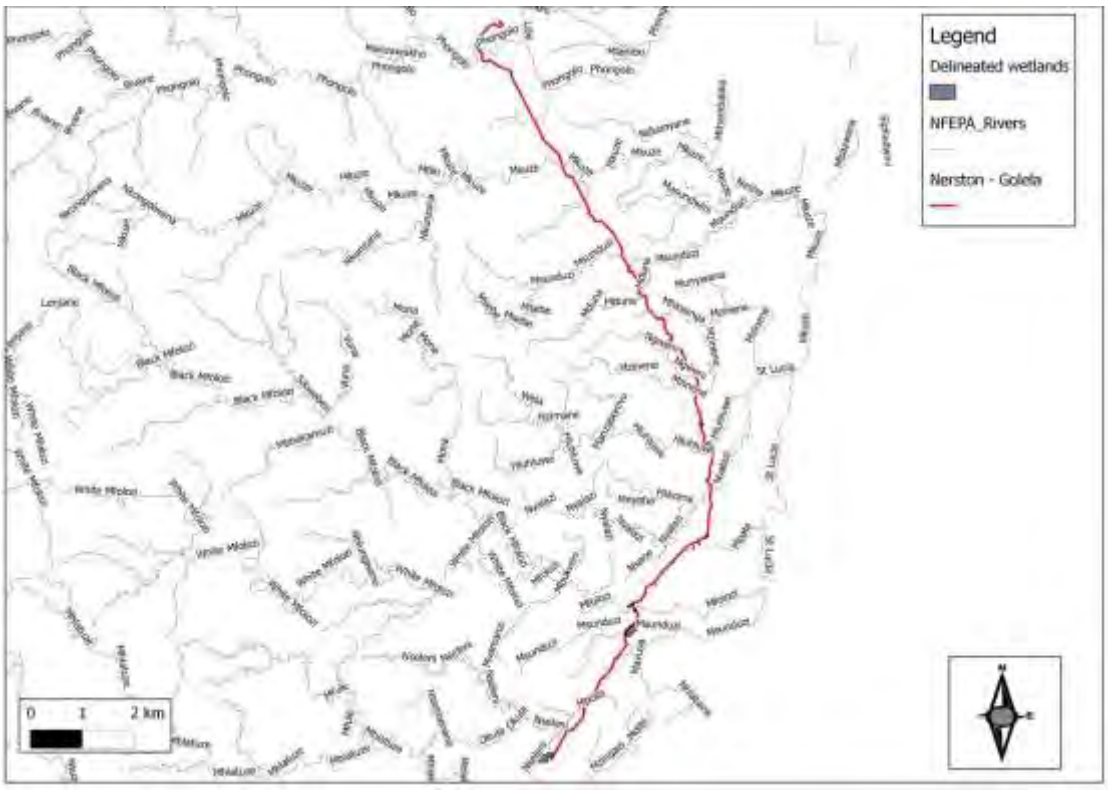

Figure 18: The main-stem rivers found along the rail line alignment, and showing the seep wetland areas delineated during the study

Notably the Endorheic pan found encircled by the proposed line, is shown to be highly modified and with little or no function (Nel *et al*., 2012 – metadata). This is possibly due to all the surrounding developments and is evident in the aerial images.

It should be noted that sections of the line that will be upgraded, will have a direct impact of a number of the wetlands identified or delineated in this study, while a remaining 18 wetlands fall within the 500m WULA zone and this any works within these areas will require Section 21 (c) & (i) Water Use Licenses.

Figure 19, Figure 20 and Figure 21 indicate areas where the new lines would impact on significant wetland areas, while several other wetlands will be traversed within area already containing rail line infrastructure or bridges and the Hydrological report should be referred to for these impacts.

These wetland areas are important habitats for potential Species of Special Concern, especially amphibians and also contained protected trees such as the Umzimbeet (*Millettia grandis*) within the ecotonal areas bordering the wetlands.

Figure 19: Freshwater marsh associated with the Hluhluwe River (S28.132219° E32.291549°) where the rail line alignment will be altered (red)

Figure 20: Freshwater marsh swamp near KwaMsane, where a new rail crossing (S28.444136° E32.155363°) is proposed (red) bordering the Mfolozi River

Figure 21: Lake Teza (S28.489126° E32.155773° on the Mzunduzi River (PES = A) with the proposed rail line in red, indicating one area that will be upgraded and one new crossing

8.2.1.2.1 Aquatic environment impact assessment – loss of habitat and removal of vegetation

Nature of the impact

Due to the nature of the project, vegetation will be cleared and replaced with rail infrastructure, service roads and stormwater management systems. The increase in rail footprint would have an impact on the valley head seeps with regard physical loss of catchment, wetland area and changes to the local hydrology. However none of the proposed areas will also impact on the proposed 50m ecological buffer with regard the line upgrading and no loops

are proposed within these areas. However several impacts already occur within and adjacent to these systems and the proposed layouts would seem to have little further impact considering the size of the footprints or the current state or lack of connectivity within the sites.

Significance of impacts without mitigation

The construction phase would have the greatest impact on the surrounding wetland areas. This will definitely result in the disturbance of the vegetation and soils within the site. Due to the site scale of disturbance in the construction period on the surrounding vegetation when compared to its current state, i.e. the magnitude would be Medium, the overall significance of would be rated as Low without mitigation.

The operational phase of the project would have limited impact on the surrounding wetland areas once the plants are allowed to re-establish themselves in any remaining areas; thus the overall intensity would remain be Low as the species assemblages would have altered from natural. It is also anticipated that the grazing pressure on the vegetation would also continue but would be equitable to the present state and thus similar to the No-Go option.

The table below indicates the impact description as well as mitigation measures proposed.

Table 29: Impact description for the loss of habitat and removal of vegetation in the aquatic habitat

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Loss of habitat and removal of vegetation - wetland and waterbodies</th></tr>
<tr><th>Predicted for project phase:</th><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><th>Dimension</th><th>Rating</th><th colspan="3">Motivation</th></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>Equal to the duration of the construction phase</td><td rowspan="3">Consequence: Slightly detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Site-specific</td><td>The increase in rail footprint would have an impact on the observed pans and valley head seeps with regard to physical loss of catchment, wetland area and changes to the local hydrology</td></tr>
<tr><td>Intensity</td><td>Moderate - negative</td><td>Several impacts already occur within and adjacent to these systems and the proposed layouts would seem to have little further impact considering the size of the footprints or the current state or lack of connectivity within the sites</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">The activity will definitely lead to on site loss of habitat and vegetation in the aquatic environment</td></tr>
<tr><td colspan="5">MITIGATION:</td></tr>
</table>

• All designs should include means to protect or maintain the current hydrological regime, thus maintaining and not impeding or diverting any surface water flows. • Stormwater management systems should include energy dissipation structures to minimise the potential impact of erosion and sedimentation. • Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum and the floodplain / wetlands habitats identified should be retained within the development footprint in its current state. • Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation • A search and rescue operation for both plants and fauna (particularly reptiles) must be initiated prior to the commencement of any construction once the required permits are in place. • Re-vegetation as part of a rehabilitation plan is always advocated, however due the nature of the vegetation, this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas. • Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	As for pre-mitigation		
Intensity	Moderate - negative	Appropriate mitigation will reduce the potential negative impacts		
Probability	Certain	Appropriate mitigation will reduce the risk of this impact		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the new Golela to Nsezi line will be constructed adjacent to the existing line, 15m either side of the centre line will not allow the contractors sufficient space to carry out construction activities. The EMP therefore proposes that **the width of the construction footprint must be agreed upon by the ECO and the Engineer and as far as possible must be kept to a minimum. The maximum width of the construction footprint servitude will not exceed 75m. Should additional space be needed for the temporary storage of material, the ECO must advise on an adequate area away from any sensitive areas**.

8.2.1.2.2 Aquatic environment impact assessment – Increase in sedimentation and erosion

Nature of the impact

This impact would be also categorised as a cumulative impact, as it would impact on the region with regard potential changes to downstream habitat quality. The increase in any surface water flow velocities within the site would then increase the risk of soil erosion and later downstream sedimentation. Should sediments eventually reach the downstream systems, this could have impacts on sediments loads, but also smother benthic habitats (plants and invertebrates).

Significance of impact without mitigation

The magnitude of this impact would be Low due to the site scale of the operations in the construction phase as well as during the operational phase, i.e. long-term, thus resulting in a Low significance.

The table below indicates the impact description as well as mitigation measures proposed.

Table 30: Impact description of the increase in soil erosion

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: An increase in soil erosion</th></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><td>Dimension</td><td>Rating</td><td colspan="3">Motivation</td></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>During construction denuded and bare areas should be monitored and managed to reduce the surface water felocity and downstream deposit of sediment</td><td rowspan="3">Consequence: Slightly detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Site-specific</td><td>Erosion could occur on denuded soil although it could have a downstream impact by way of sediment depositing</td></tr>
<tr><td>Intensity</td><td>Moderate - negative</td><td>Due to the site scale of the operations in the construction phase as well as during the operational phase</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">Due to the type of activity the potential exist for erosion on denuded soil</td></tr>
<tr><td colspan="5">MITIGATION:
• During construction, erosion should be monitored while areas of vegetation are being cleared.
• Hard engineered surfaces that increase surface water run-off should be limited and a stormwater management plan should be created for the development for the operations phase.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>As for pre-mitigation</td><td rowspan="3">Consequence: Negligible</td><td rowspan="4">Significance: Very low</td></tr>
<tr><td>Extent</td><td>Site-specific</td><td>As for pre-mitigation</td></tr>
<tr><td>Intensity</td><td>Low - negative</td><td>Mitigation measures will decrease the intensity of erosion</td></tr>
<tr><td>Probability</td><td>Very likely</td><td colspan="2">Mitigation will decrease probability of erosion on cleared areas</td></tr>
</table>

8.2.1.2.3 Aquatic environment impact assessment – Changes to the hydrological regime within the wetland environment

Nature of the impact

Due to the nature of the proposed project this would be an operational phase impact, limited to when the rail and water course crossing features and any erosion protection structures have been constructed. These structures could interfere with natural run-off patterns, either diverting flows or increasing the velocity of surface water flows. This has the potential to increase or decrease surface water flows into riparian areas.

Significance of impact with mitigation

Although permanent changes to the local hydrological regime are probable, the magnitude of the impact in the operational phase would be Low but on a site wide scale in the long-term, thus the overall significance of this impact would be Low.

The table below indicates the impact description as well as mitigation measures proposed.

Table 31: Impact description for the hydrological impacts on wetlands

IMPACT DESCRIPTION: Hydrological impacts on wetlands				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Structures could interfere with natural run-off patterns, either diverting flows or increasing the velocity of surface water flows and has the potential to increase or decrease surface water flows into wetland areas	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Site-specific	Impact will generally be confined to specific areas		
Intensity	Moderate - negative	Permanent changes to the local hydrological regime are probable, the intensity of the impact in the operational phase would be moderate but on a site wide scale in the long-term		
Probability	Fairly likely	Due to the type of activity the potential exist for erosion on denuded soil		
MITIGATION: • Surface water management features such as the crossing of drainage lines, should be placed in manner that flows remain unaltered in terms of direction, velocity and volume, thus the natural base flows, i.e. hydrological regime within these systems is maintained. • It is also important that during construction and operations that excess ballast is not allowed to enter any water course areas, culverts etc.				
POST-MITIGATION				
Duration	Long-term	Mitigation can reduce the risk of lasting negative effects	Consequence: Slightly detrimental	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Low - negative	Mitigation measures should be effective in reducing severity of impacts		
Probability	Unlikely	Mitigation measures would reduce probability of impacts occuring to the extent predicted		

8.2.1.3 Biodiversity conservation

Ezemvelo KwaZulu-Natal Wildlife Systematic Biodiversity Conservation Plan (KZNSCP)

The provincial conservation authority together with a broad range of stakeholders assessed the conservation status of the province using the GIS based C-Plan Conservation Planning System. This produced a conservation map of the province at a Quarter Degree Square (QDS) level, ranking the irreplaceability of each cell or square (Figure 22). The degree of irreplaceability was based on a weighted score of the potential for important or sensitivity species / habitats to occur or known to occur within each QDS cells. Several “Totally Irreplaceable” QDS cells are intersected by line. However the majority are associated with protected mammal species such as the Black Rhino found in the large number of protected areas adjacent to the line, such as Mkuze, and Hluhluwe Nature Reserves.

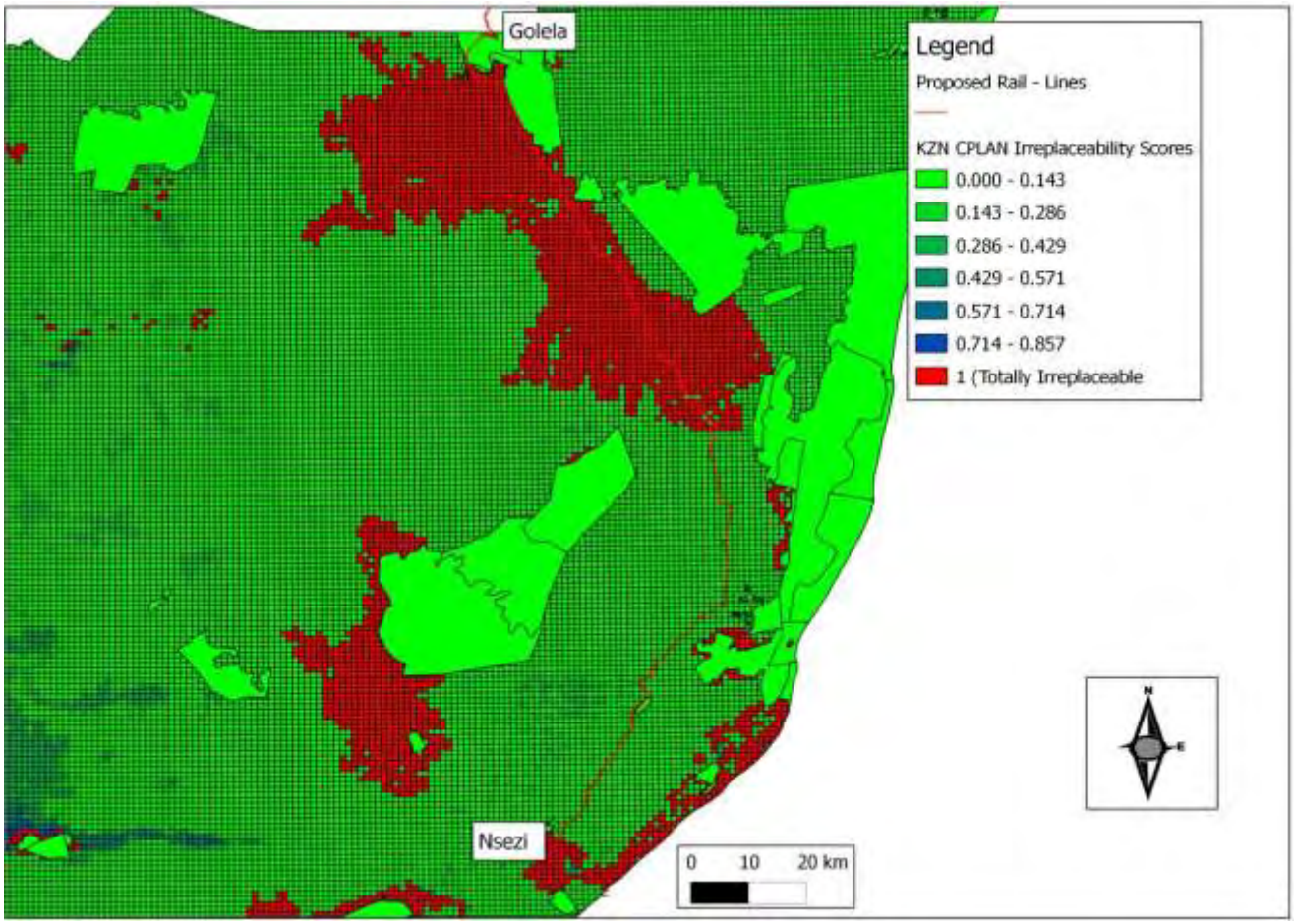

Figure 22: A map illustrating the irreplaceability categories that intersect with the line based on results from the Ezemvelo KZN Wildlife Conservation Plan

Maputaland-Pondoland-Albany Biodiversity Hotspot Conservation Plan (2010)

The Maputaland-Pondoland-Albany Hotspot (MPAH) spans parts of South Africa, Swaziland and Mozambique. In southern Africa, it is second to the Cape Floristic Region in floristic diversity. A systematic conservation plan was implemented for the Maputaland-Pondoland-Albany Hotspot in order to identify priority areas for conservation. The biodiversity map delineates 72 key biodiversity areas (KBA) and 12 conservation corridors. Of the 72 key biodiversity areas, several fall along the railway route.

Three of the 12 conservation corridors are positioned across the railway route, which encompass all the key biodiversity areas. The corridors comprise the Lebombo Transfrontier Corridor and the Zululand Corridor. Although the KwaZulu-Natal Coastal Belt Corridor does not lie adjacent to or across the railway route, the climate change resilience corridor extends between Mfolozi River to Richards Bay, which also represents one of the key biodiversity areas, delineated as ''KwaZulu Coastal Belt W1''. Both the Zululand Corridor and the KwaZulu-Natal Coastal Belt Corridor are covered by the KwaZulu-Natal (KZN) Terrestrial Conservation Plan.

Lebombo Transfrontier Corridor

The Lebombo Transfrontier Corridor extends across parts of Swaziland and KwaZulu-Natal, as well as Mozambique, encompassing the Lubombo Mountains and the Maputaland Centre of Endemism. It is comprised almost exclusively of Savannah. The Licuati Forests and Eastern Swazi Lebombo Protected Areas contain endemic sand forests, containing the highest diversity compared with any other temperate forest in the world. Approximately 10% of the Lubombo Transfrontier is Threatened habitat. Zululand lowveld is the only Vulnerable

habitat associated with the portion of the Corridor proximate to or traversing the railway. The Vulnerable Lubombo girdled lizard (*Cordylus warreni*) and the Endangered fish, *Sihouettea sibayi*, represent Threatened species inhabiting the corridor.

Zululand Corridor

The Zululand Corridor is situated in KwaZulu-Natal extending from the Swaziland and Mozambique borders to St Lucia in the south. Most of the corridor is covered with Savannah. The Vulnerable Zululand Lowveld habitat spans the majority of this corridor along the railway line, while the Critically Endangered Lowveld Riverine Forest occurs as small patches near the southern end of the railway, as well as the Endangered Maputaland Coastal Belt. Critically Endangered species such as Black Rhino and elephant inhabit this area.

KwaZulu-Natal (KZN) Coastal Belt Corridor

The KZN Coastal Belt Corridor stretches from the Mfolozi River in the north to Port Edward in the south, with the railway line traversing or running proximate to it between Mfolozi and Richards Bay. The Endangered Maputaland Coastal Belt habitat occupies most of the natural cover surrounding the railway line route in this corridor. The amphibians *Hyperolius pickersgilli, Natalobatrachus bonebergi, Afrixalus spinifrons* and *Hemisus guttatus,* the Sclater's forest shrew (*Myosorex sclateri*), spotted ground-thrush (*Zoothera guttata*), and a number of plant species represent Threatened species inhabiting this corridor.

Table 32: Distribution of Threatened Species in each Conservation Corridor and Priority Ranking

Corridor	Critically Endangered	Endangered	Vulnerable	Total species	% of hotspot	Total Summary	Priority Ranking (out of the 12 corridors)
Lebombo Transfrontier	9	16	32	57	9	Medium	7
Zululand	3	18	45	66	11	Medium	9

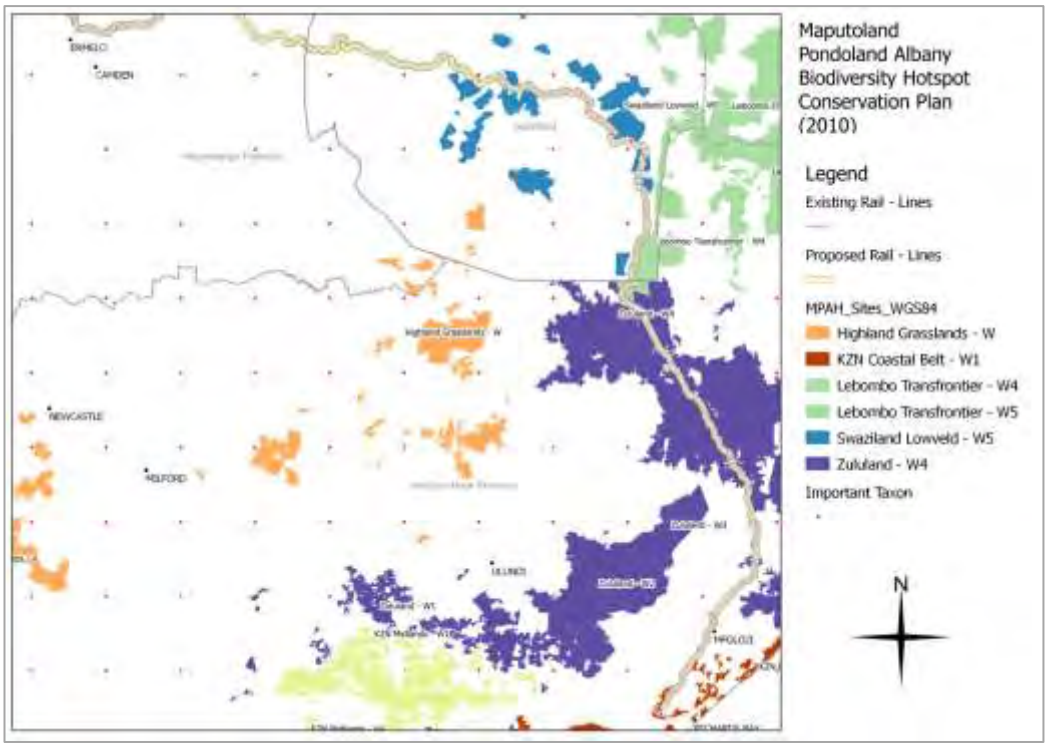

Figure 23: Key Biodiversity Areas (KBA) mapped in the Maputoland-Pondoland Albany Hotspot (MPAH) conservation plan, which intersect the railway alignment. Note that all these KBA are incorporated into the MPAH corridors, apart from the KZN Coastal Belt W1 area between Mfolozi and Richards Bay.

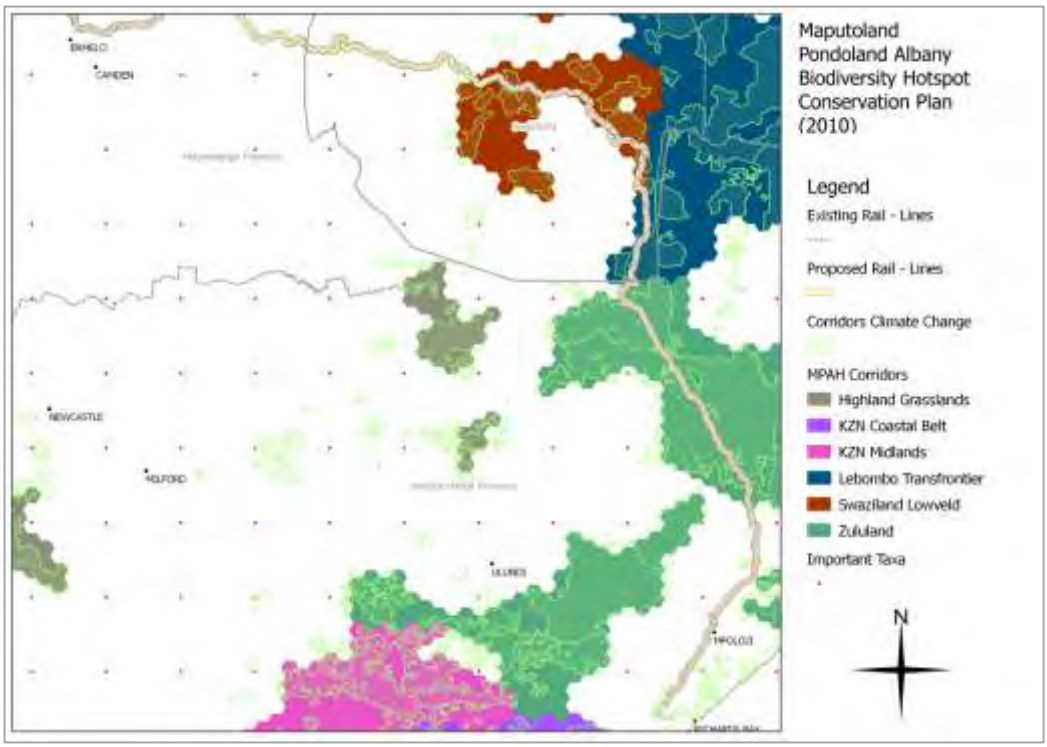

Figure 24: Important Corridors according to the Maputoland-Pondoland Albany Hotspot (MPAH) conservation plan intersecting the railway alignment. The climate change corridors indicate those areas most important for enhancing resilience to climate change impacts.

Species of Concervation concern:

Species of Conservation Concern refer to taxa that are Threatened and Protected. Species are ''Threatened'' if classified by the IUCN (International Union for Conservation of Nature) Red List of Threatened Species as Rare, Critically Endangered, Endangered, Vulnerable or Near Threatened.

Protected species refer to those taxa that are protected under the National Environmental Management: Biodiversity Act (10 of 2004), the National Forest Act (84 of 1998), the KwaZulu-Natal Nature Conservation Amendment Act (5 of 1999).

A list of potential Species of Conservation Concern was derived from the Maputaland-Pondoland-Albany Biodiversity Hotspot conservation plan (SANBI, 2010), which incorporate Threatened species and species listed under the National Biodiversity Act for KZN, Mpumalanga and Swaziland (Table 33).

A number of trees, protected under the National Forest Act, and only some of the species protected via the provincial legislation, are contained in the listing. Species were mapped according to their location in a Quarter Degree Square (i.e. an area of approximately 30 km by 30 km covered by one 1:50 000 South African topographical map). Those quarter degree squares that overlapped the railway route were selected to generate a list of potential Species of Conservation Concern along the railway alignment (Figure 25).

Table 33: List of potential Species of Conservation Concern sited in close proximity to the railway alignment in KwaZulu-Natal Province.

Species (Taxa)	Common Name	Red Data Listing
Amphibians		
Afrixalus spinifrons	Natal Banana Frog	VU
Hemisus guttatus	Spotted Snout-burrower	VU
Hyperolius pickersgilli	Pickersgill's Reed Frog	EN
Hyperolius pickersgilli	Pickersgill's Reed Frog	EN
Birds		
Geronticus calvus	Southern Bald Ibis	VU
Gyps coprotheres	Cape Vulture	VU
Stactolaema olivacea	Green Barbet	LC
Torgos tracheliotus	Lappet-faced Vulture	VU
Falco naumanni	Lesser Kestrel	VU
Zoothera guttata	Spotted Ground-thrush	EN
Gyps africanus	White-backed Vulture	NT
Aegypius occipitalis	White-headed Vulture	VU
Invertebrates		
Allawrencius gladiator		Not Listed
Centrobolus fulgidus		Not Listed
Centrobolus richardi		Not Listed
Centrobolus rugulosus		Not Listed

Doratogonus natalensis		Not Listed
Doratogonus peregrinus		Not Listed
Doratogonus zuluensis		Not Listed
Edouardia conulus		Not Listed
Fairy shrimp	Fairy shrimp	Not Listed
Gulella zuluensis		Not Listed
Ingwavuma slender spined millipede	Ingwavuma slender spined millipede	Not Listed
Inhaca wingless grasshopper	Inhaca wingless grasshopper	Not Listed
Ivory striped wingless grasshopper	Ivory striped wingless grasshopper	Not Listed
Maputaland cannibal snail	Maputaland cannibal snail	Not Listed
Orange whisp	Orange whisp	Not Listed
Orthoporoides corrugatus		Not Listed
Pennington's white mimic	Pennington's white mimic	Not Listed
Peter's flat backed millipede	Peter's flat backed millipede	Not Listed
St Lucia purple fruit chafer	St Lucia purple fruit chafer	Not Listed
Zinophora laminata		Not Listed
Zulu buff	Zulu buff	Not Listed
Zulu darner	Zulu darner	Not Listed
Mammals		
Diceros bicornis	Black Rhino	CR
Acinonyx jubatus	Cheetah	VU
Hippopotamus amphibius	Hippopotamus	VU
Panthera leo	Lion	VU
Ourebia ourebi	Oribi	LC
Cercopithecus mitis	Samango Monkey	LC
Myosorex sclateri	Sclater's Forest Shrew	NT
Cloeotis percivali	Short-Eared Trident Bat	LC
Lycaon pictus	Wild Dog	EN
Plants		
Asclepias gordon-grayae		EN
Aspalathus gerrardii		VU
Begonia dregei		EN
Bonatea lamprophylla		VU
Brachystelma sandersonii		VU
Bruguiera gymnorrhiza		VU
Cassipourea gummiflua verticillata		VU
Cavacoa aurea		VU

Cola natalensis		VU
Crinum moorei		VU
Cryptocarya myrtifolia		VU
Didymoplexis verrucosa		VU
Encephalartos lebomboensis		EN
Encephalartos ngoyanus		VU
Encephalartos senticosus		VU
Euphorbia keithii		CR
Fimbristylis aphylla		VU
Habenaria woodii		VU
Kniphofia leucocephala		CR
Kniphofia pauciflora		CR
Ceropegia arenaria		EN
Diospyros glandulifera		LC
Kniphofia littoralis		NT
Mystacidium aliceae		VU
Nesaea wardii		VU
Raphia australis		VU
Restio zuluensis		VU
Senecio ngoyanus		VU
Stangeria eriopus		VU
Thesium polygaloides		VU
Warburgia salutaris		EN
Melhania polygama		VU
Pachycarpus lebomboensis		Rare
Rhus kwazuluana		
Reptiles		
Bitis gabonica	Gaboon Viper	VU
Bradypodion setaroi	Setaro's Dwarf Chameleon	EN
Bradypodion caeruleogula		Not Listed
Coastal dwarf burrowing skink	Coastal dwarf burrowing skink	Not Listed
Fitzsimon's dwarf burrowing skink	Fitzsimon's dwarf burrowing skink	Not Listed
Lycophidion pygmaeum		Not Listed
Pygmy wolf snake	Pygmy wolf snake	Not Listed
Setaro's dwarf chameleon	Setaro's dwarf chameleon	Restricted
Trachylepis margaritifera		Not Listed
Warren's girdled lizard	Warren's girdled lizard	Not Listed

Zululand dwarf burrowing skink	Zululand dwarf burrowing skink	Not Listed

(CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern)

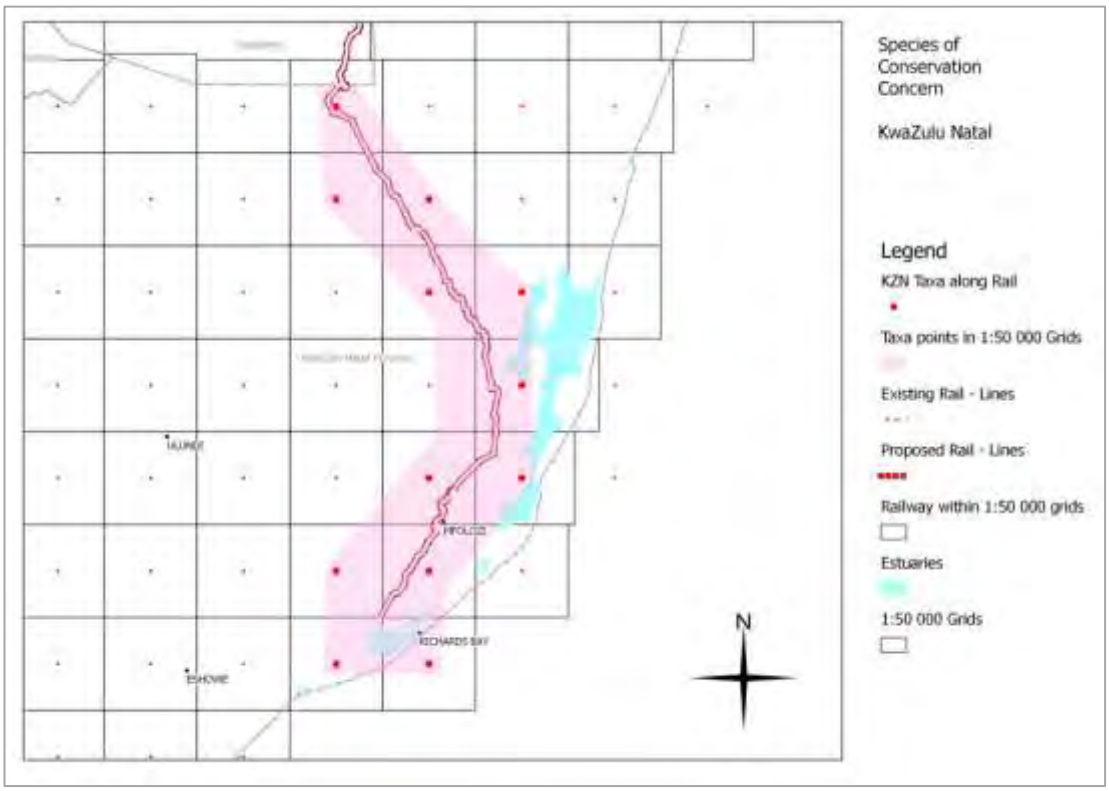

Figure 25: Important taxa (species) as point data, mapped according to species location in a Quarter Degree Square (i.e. an area of ± 30 km X 30 km covered by one 1:50 000 South African topographical map) by the Maputaland-Pondoland-Albany Biodiversity Hotspot conservation plan (SANBI, 2010) in KZN province.

None of these species were observed during the site visit however specimens within the proposed new servitudes of *Millettia grandis* were observed.

8.2.1.3.1 Biodiversity impact assessment – loss of corridors and habitat fragmentation

Nature of the impact

Due to the nature of the project vegetation will be cleared and replaced with rail lines and supporting infrastructure and this will result in additional habitat fragmentation both within the terrestrial and aquatic environments, i.e. the elevated embankments on which the rail lines would disrupt movement corridors. The construction phase would have the greatest impact in terms of habitat destruction, but the actual impact of fragmentation would occur in the operational phase.

Significance of impact without mitigation

It is anticipated that this impact would be definite and the impact on the fragmentation would remain within the Local area, resulting in a long-term impact of Medium for the operational phase, resulting in a Medium significance.

The table below describes the impact of the potential loss of corridors and habitat fragmentation and the proposed mitigation measures.

Table 34: Impact description of the loss of corridors and habitat fragmentation

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Loss of corridors and habitat fragmentation</th></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><td>Dimension</td><td>Rating</td><td colspan="3">Motivation</td></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Long-term</td><td>The construction phase would have the greatest impact in terms of habitat destruction, but the actual impact of fragmentation would occur in the operational phase</td><td rowspan="3">Consequence: Moderately detrimental</td><td rowspan="4">Significance: Moderate - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>Vegetation will be cleared and replaced with rail lines and supporting infrastructure and this will result in additional habitat fragmentation both within the terrestrial and aquatic environments</td></tr>
<tr><td>Intensity</td><td>Moderate - negative</td><td>The construction of the railway line will restrict movement of fauna to a degree.</td></tr>
<tr><td>Probability</td><td>Very likely</td><td colspan="2">Due to the nature of the activity it will have a definite impact on the corridors of movement resulting in fragmentation</td></tr>
<tr><td colspan="5">MITIGATION:
• Where extensive or elevated (>2m in height) embankments are required in sensitive areas such as game reserves it is advised that additional culverts are installed to provide access for fauna.
• Wetland and floodline areas (1:100 year) must be excluded from development as far as possible, i.e. designs should include means to span these areas thus maintain open ecological networks.
• Where culverts are installed across drainage lines and watercourses, the proposed designs should ensure that natural ground levels are maintained, i.e. the culvert base does pose as an obstacle for the movement of aquatic organisms.
• Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation
• Re-vegetation as part of a rehabilitation plan is always advocated, however due the nature of the vegetation, this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas.
• Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Long-term</td><td>As for pre-mitigation</td><td rowspan="3">Consequence: Moderately detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>With the implemetation of the proposed mitigating measures the impact on fragmentation would remain in the local sphere</td></tr>
<tr><td>Intensity</td><td>Moderate - negative</td><td>The proposed mitigation will reduce impacts to some extent</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Mitigation will reduce the risk of these impacts to some extent</td></tr>
</table>

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the new Golela to Nsezi line will be constructed adjacent to the existing line, 15m either side of the centre line will not allow the contractors

sufficient space to carry out construction activities. The EMP therefore proposes that **the width of the construction footprint must be agreed upon by the ECO and the Engineer and as far as possible must be kept to a minimum. The maximum width of the construction footprint servitude will not exceed 75m. Should additional space be needed for the temporary storage of material, the ECO must advise on an adequate area away from any sensitive areas**.

8.2.1.3.2 Biodiversity impact assessment: Loss of species of special concern

Nature of impact

Any loss of systems could possibly result in the loss of species of special concern within the habitats as a result of their destruction during the construction phase.

However, no flora and fauna species of special concern were evident during the study within the wetland or water course areas, as well as the terrestrial habitats, possibly due to the intensity of farming, housing and rail infrastructure already found in the study area. The lack of any rainfall also seemed to precluded the early growth or appearance of species known to occur in the area so as precautionary step, it is important that all riparian areas are retained and allowed to function, as a number of protected species listed do occur within the region.

Significance of impact without mitigation

The impact would be rated as a regional impact due to the species under consideration and the lack of potential habitat still remaining. The impact would persist into the long-term however the unlikely probability of finding such species the magnitude and significance of the impact magnitude would be Low. The impact significance would be rated as Low without mitigation due to confidence in this assessment based in the reasons listed above.

The table below describes the impact of the potential loss of rare and endangered species and the proposed mitigation measures.

Table 35: Impact description for the potential loss of rare and endangered species

IMPACT DESCRIPTION: Loss of rare and endangered species				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Any loss of systems could possibly result in the loss of species of special concern within the habitats as a result of their destruction during the construction phase but could persist into the long term.	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Regional	Due to the species under consideration and the lack of potential habitat still remaining.		

Intensity	Low - negative	In view of the unlikely probability of finding such species together with the proposed mitigations, the intensity of the impact would be low		
Probability	Unlikely	No flora and fauna species of special concern were evident during the study within the wetland or water course areas, as well as the terrestrial habitats, possibly due to the intensity of farming, housing and rail infrastructure already found in the study area		

MITIGATION:

• All designs should include means to protect or maintain the current hydrological regime, thus maintaining and not impeding or diverting any surface water flows.
• Stormwater management systems should include energy dissipation structures to minimise the potential impact of erosion and sedimentation.
• Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum and the floodplain / wetlands habitats identified should be retained within the development footprint in its current state.
• Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation
• A search and rescue operation for both plants and fauna (particularly reptiles) must be initiated prior to the commencement of any construction once the required permits are in place.
• Re-vegetation as part of a rehabilitation plan is always advocated, however due the nature of the vegetation, this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas.
• Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.

POST-MITIGATION				
Duration	Long-term	As per pre-mitigation	Consequence: Moderately detrimental	Significance: Very low
Extent	Regional	As per pre-mitigation		
Intensity	Low - negative	As per pre-mitigation		
Probability	Very unlikely	As per pre-mitigation		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the new Golela to Nsezi line will be constructed adjacent to the existing line, 15m either side of the centre line will not allow the contractors sufficient space to carry out construction activities. The EMP therefore proposes that **the width of the construction footprint must be agreed upon by the ECO and the Engineer and as far as possible must be kept to a minimum. The maximum width of the construction footprint servitude will not exceed 75m. Should additional space be needed for the temporary storage of material, the ECO must advise on an adequate area away from any sensitive areas**.

8.2.1.3.3 Biodiversity impact assessment – The potential spread of alien vegetation

Nature of the impact

Large areas did contain alien plants, and these are mostly limited to disturbed areas or forestry areas and included the exotic *Senna didimobtryra*, *Acacia mearnsii, Pinus* and *Eucalyptus* stands for example.

Significance of impact without mitigation

With the above mitigation measures in place, the impact on the vegetation would remain within the site, with natural re-vegetation happening within a short time period, resulting in a Very Low impact significance with mitigation (Low, without). This is also based on the fact that during the operational phase on-going clearing and maintenance practices will be employed by Transnet.

The table below describes the potential impact of the introduction of alien vegetation and the proposed mitigation measures.

Table 36: Impact description for the introduction of alien and invasive species

IMPACT DESCRIPTION: Introduction of alien and invasive species				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Will be limited to construction phase	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Potential for spread of alien species in newly cleared areas		
Intensity	Low - negative	A large area of the project is already disturbed and planted with alien species.		
Probability	Fairly likely	The disturbance of vegetation can easily lead to the establishment of new colonies of alien and invasive species		
MITIGATION: • Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum. • Re-vegetation as part of a rehabilitation plan is always advocated, however to the low annual rainfall (normal conditions), this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas. • Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.				
POST-MITIGATION				
Duration	Medium-term	As for pre-mitigation	Consequence: Slightly detrimental	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Low - negative	Mitigation measures will reduce the potential spread of alien species and natural re-vegetation can take place		
Probability	Unlikely	Mitigation measures will reduce likelihood of spread of alien species and clearing of the sites during operational phase will further reduce the possible negative impacts.		

8.2.1.4 Conclusions and recommendations of the ecological assessment undertaken

The results, based on the available information and the site investigations, show that the proposed line could impact on a number of sensitive and / or important terrestrial and aquatic habitats. However several of the metadata sources for the spatial data shown in this report also indicate that large areas of habitat at a broad scale are degraded or transformed. This is also supported by the observed land use character shown in the aerial images (Google Earth). This was confirmed during the site visit. Concern is raised with regard the potential impacts on the three wetland areas identified within this study (Hluhluwe, Mfolozi and Lake Teza).

It would therefore seem based on the site visit and the type of habitats observed that the proposed extension of rail lines and yard would have a limited impact on both the terrestrial aquatic environment if the mitigations and recommendations are upheld:

Compilation and implementation of a Construction Environmental Management Programme (CEMP), that provides specifications with regards to:

- Rehabilitation with indigenous plants species. (i.e. a Rehabilitation Plan).
- Plant removal within the construction footprint only.
- Alien clearing and management within the development footprint / construction area.
- Detailed storm-water management and erosion control plan.
- Waste management:
    - to prevent accidental leakage of pollutants e.g. oil, fuel, cement,
    - to identify procedures for solid waste disposal (e.g. bins, no littering or burning policy and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site,
    - to ensure that no re-fuelling of construction vehicles or maintenance activities occur proximate to the non-perennial stream (drainage area) to the west of the sites; and
    - to designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the non-perennial stream (drainage area) to the west of the sites
- Other generic mitigation measures associated with construction.
- Employment of an Environmental Control Officer to oversee the implementation of the CEMP and the Record of Decision (Environmental Authorisation).

The period and frequency of monitoring will most likely be stipulated by the Environmental Authorisation. Where this is not clearly dictated, the ECO should determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Resident Engineer and ECO must ensure that the monitoring is conducted and reported.

The following protocols are recommended with regards to monitoring and should be read in conjunction with the CEMP which has already been finalised:

- Weekly environmental auditing.
- Monthly or quarterly environmental audit reports to be submitted to the relevant department.
- Immediate notification of transgression to the Site Manager (& Project Contractor/Engineer) and provision of suitable mitigation measures to rectify environmental damage.
- If transgressions continue, report such incidences to the DWA immediately, although such incidences must be recorded in the audit reports.

To this end, it is suggested that the Proponent, Contractor and ECO also consult the following guideline as reference:

Department of Water Affairs and Forestry, February 2005. ***Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria***

Department of Water Affairs and Forestry, February 2005. ***Environmental Monitoring and Auditing Guideline****. Integrated Environmental Management Sub-Series No. IEMS 1.7. Third Edition. Pretoria.*

8.2.2 Hydrology assessment

Aurecon conducted the hydrological assessment for the project. The specialist report can be found in Appendix B, Annexure C. A short description of the impacts assessed follows.

In the KZN section the rail alignment runs close to several important hydrological features including the lake St Lucia system, Phongola Dam and Lake Eteza Nature Reserve. There are several large rivers such as the Mfolozi, Mkuze and Phonglo which flow through the region. The alignment crosses each of these rivers once. The iSimangaliso Wetland Park, which contains the Lake St Lucia system, is a World Heritage Site. The Lake St Lucia system current-day sources of fresh water inflows are the Mkuze, Mzinene, Hluhluwe and Nyalazi as well as number of smaller catchments.

Mean annual precipitation for catchments in the study area range from 550mm to over 1000mm. The study area is a major agricultural area and includes both commercial sugarcane and timber plantations as well as significant amounts of subsistence agriculture.

Predominant soil types vary from loamy soils in the high elevations of the western catchments, to loamy sands in the bottom third of the catchment, and sandy clay loam in the low lying regions of the eastern catchments. The stream frequency of the KZN region in which the rail alignment traverses is low to medium and the drainage density is low (Kleynhans *et al.,* 2005).

The major crossing that were identified as potential sites of concern and requiring a field assessment are listed in Table 37 together with information relating to the Quaternary Catchment in which the crossing is located.

Table 37: Major watercourse crossings and Quaternary Catchment Information

Crossing No	Lat	Long	River Name	Quat number	Quat MAP (mm)	Quat Runoff (mm)
1	28°38'28.97" S	32°03'39.65" E	Mposa	W12H	1039	83
2	28°30'07.11" S	32°08'22.16" E	Msunduzi	W23B	920	24
3	28°26'47.54" S	32°09'20.52" E	Mfolozi	W23D	1039	35
4	28°12'26.58" S	32°17'59.16" E	Nyalazi	W32G	846	54
5	28°08'07.07" S	32°18'18.15" E	Hluhuwe	W32F	783	11
6	28°02'23.58" S	32°16'38.75" E	Mzinene	W32C	686	25
7	28°00'09.64" S	32°16'33.66" E	Ngweni	W32C	686	25
8	27°52'29.83" S	32°11'10.97" E	Mhlosinga	W32C	686	25
9	27°50'40.36" S	32°10'17.02" E	Mduna	W31K	645	23
10	27°46'27.25" S	32°08'13.63" E	Msunduzi	W31K	645	23
11	27°39'47.60" S	32°03'41.23" E	KwaSekane	W31H	651	9

12	27°35'38.19" S	32°01'05.66" E	Mkuze	W31H	651	9
13	27°30'30.87" S	31°57'53.69" E	Mhlanganisi	W44E	581	15
14	27°22'10.70" S	31°51'22.48" E	Phongolo	W44D	564	4

Impacts on surface waters will occur during rail construction. Pollution from mobilised suspended solids is the major concern particularly where there are water abstractions close to the watercourse crossing as well at those crossings that are upstream of nature reserves or dams. Sediment mobilisation can be prevented in the most part in the construction phase by the use of silt traps. These silt traps would need to be cleaned regularly. If best practice is followed in bridge and culvert design then erosion and sediment mobilisation in the long term will have a limited impact. Good practice would include upstream downstream and downstream erosion protection.

It is not anticipated that there would be major hydraulic related impacts during high flows at the crossings of the major water courses. This assumption is based on Swaziland Rail Link FEI-2 (Mott MacDonald, 2013) study, where the drawings of major drainage structures show the height of the structure openings to be well above the 1:100 year flood level. For the minor crossing where culverts maybe constructed, the flow velocity downstream of the culvert should not be greater than pre-construction velocity. In order to mitigate an increase in flow velocity, a structure to dissipate the energy maybe required.

Another impact during the construction phase is the accidental spillage of fuels and hydraulic fluids from construction plant. Therefore, storage of fuel, oils and chemicals should be on an impermeable base, away from drains and watercourses.

Crossing 1: Mposa River, Nseleni KZN (Lat 28°38'28.97" S, Long 32°03'39.65" E)

Figure 26: Ariel view crossing 1

Figure 27: Existing Mposa River Bridge

Figure 28: Looking upstream Mposa crossing

Figure 29: Looking downstream Mposa crossing

As the railway itinerary goes along the KwaZulu-Natal coast, it crosses several rivers that run into the Indian Ocean. About 5km northeast of Nseleni, in a region with land use dominated by forestry and logging activities, the railway crosses the Mposa River, which flows away from the coast into the Nseleni River. Regarding flow, the Mposa River displays strong seasonal variability and it flows during the wet summer months. Flow in the river during the rest of the year is very low. Flow channel and banks ill-defined, obstructed with vegetation (Figure 27 and Figure 28). They're will be a duplication of the existing operating railway (see Figure 27) so the impacts will mainly result from construction phase with short term time scale. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 2 – Msunduzi River, Lakeview KZN (Lat 28°30'07.11" S Long 32°08'22.16" E)

Figure 30: Ariel view Msunduzi crossing

Figure 31: N2 crossing Msunduzi River 150m upstream

Figure 32: Looking downstream Msunduzi River

The existing railway crosses the Msunduzi immediately upstream of the Lake Eteza Nature reserve. The new crossing will be 1400m upstream of the existing bridge and 150m downstream of the N2 Msunduzi crossing. The longer term impacts will be similar to those of the existing bridges.

Regarding flow, the Msunduzi River displays normal seasonal variability with higher flows in summer months and permanent flow all year round. However, it should be noted that flooding occurred in July 2002 and July 2004. A flood peak of 1300 m^3/s was recorded in March 1925 (Kovacs, 1988). The flow channel and banks are well defined and relatively stable. Impacts during the construction phase include the introduction of sediment and erosion of banks.

Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 3 – Mfolozi River, KwaMsane KZN (Lat 28°26'47.54" S Long 32°09'20.52" E)

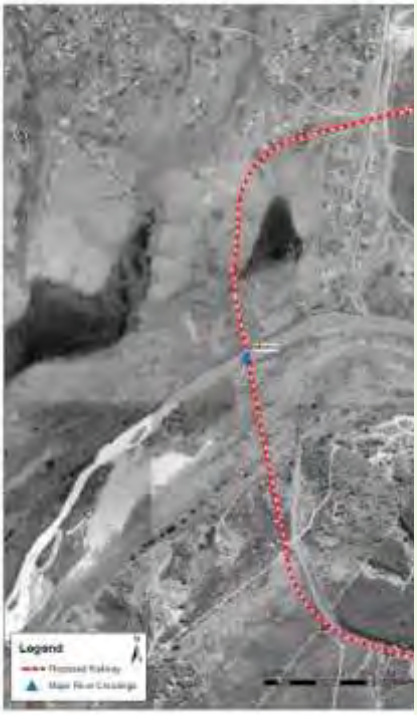

Figure 33: Aerial view Mfolozi crossing

Figure 34: Abstraction 400m downstream of existing bridge

Figure 35: Mfolozi crossing upstream of existing bridge

The Mfolozi River crossing is close to the KwaMsane settlement (Figure 33). The new crossing is 250m upstream of the existing rail bridge. The two alignments are either side of the wetland at KwaMsane and come together at the rail tunnel.

The flow channel and banks are well defined and relatively stable. Regarding flow, the Mfolozi River displays normal seasonal variability but permanent all year round. It should be noted that flooding occurred in July 2002 and July 2004. A flood peak of 16 000m^3/s was recorded 5 km upstream of the N2 road bridge in January 1984 (Kovacs, 1988).

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the mobilisation of sediment and erosion of banks. There is an abstraction 400 m downstream (see Figure 34), apparently for drinking water supply. WWTP located 600 m downstream, with effluent discharged into the river.

Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 4 – Nyalazi River, Mfekayi KZN (Lat 28°12'26.58" S Long 32°17'59.16" E)

Figure 36: Aerial view Nyalazi crossing

Figure 37: Existing Nyalazi bridge

Figure 38: Looking upstream Nyalazi crossing

Figure 39: Looking downstream Nyalazi crossing

The Nyalazi crossing is near to the Mfekayi, settlement with the major land use being substance agriculture and grazing of cattle. The Nyalazi is a tributary of iSimangaliso Wetland Park (a world heritage site), which is situated 22km downstream. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems.

The Nyalazi River has permanent flow with high flow from November to April. It should be noted that flooding occurred in July 2002 and 2004. The banks close to the existing rail crossing have been significantly eroded by cattle activities and floods (Figure 81).

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 5 – Hluhluwe River, Qakwini KZN (Lat 28°08'07.07" S Long 32°18'18.15" E)

Figure 40: Aerial view Hluhluwe crossing

Figure 41: Existing Hluhluwe bridge

Figure 42: Irrigation water abstraction

Figure 43: Looking upstream Hluhluwe crossing

Figure 44: Looking downstream Hluhluwe crossing

The Hluhluwe crossing is near to the Qakwini settlement with the major land use being substance agriculture and grazing of cattle. The Hluhluwe is a tributary of iSimangaliso Wetland Park (a world heritage site), which is situated 16km downstream. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems.

The Hluhluwe River has permanent flow with high flow from November to April. It should be noted that flooding occurred in July 2002 and 2004. At the upstream Hluhluwe Dam a flood peak of 3060 m^3/s in July 1963 (Kovacs, 1988).The banks close to the existing rail crossing have been significantly eroded by cattle activities and floods (Figure 43). There is a small irrigation abstraction system (including weir) immediately downstream the river crossing.

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 6 – Mzinene River, Hluhluwe KZN (Lat 28°02'23.58" S Long 32°16'38.75" E)

Figure 45: Aerial view Mzinene River

Figure 46: Existing Mzinene bridge

Figure 47: Looking upstream Mzinene River

Figure 48: Looking downstream Mzinene River

The Mzinene crossing is near to the Hluhluwe settlement with the major land use being substance agriculture and grazing of cattle. The Mzinene is a tributary of iSimangaliso Wetland Park (a world heritage site), which is situated 40km downstream. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems. The Mzinene River is an ephemeral watercourse with high flow from November to April. It should be noted that flooding occurred in July 2002 and 2004. The river channel and banks ill-defined, obstructed with dense vegetation (see Figure 46 and Figure 47). Hluhluwe WWTP is located 600 m upstream, with effluents discharged into the river

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 7 – Ngweni River, Hluhluwe KZN (Lat 28°00'09.64" S Long 32°16'33.66" E)

Figure 49: Aerial view Ngweni crossing

Figure 50: Existing Ngweni Bridge

Figure 51: Looking upstream at Ngweni crossing

Figure 52: Looking downstream at Ngweni crossing

The Ngweni crossing is near to the Hluhluwe settlement with the major land use being substance agriculture and grazing of cattle. The Ngweni is a tributary of iSimangaliso Wetland Park (a world heritage site), which is situated 35km downstream. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems. The Ngweni River is an ephemeral watercourse with high flow from November to April. It should be noted that flooding occurred

in July 2002 and 2004. The river channel and banks ill-defined, obstructed with dense vegetation (see Figure 51 and Figure 52).

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers

Crossing 8 – Mhlosinga River, Mhlongisa KZN (Lat 27°52'29.83" S Long 32°11'10.97"E)

Figure 53: Aerial view Mhlongisa River crossing

Figure 54: Existing Mhlongisa bridge

Figure 55: Looking upstream at Mhlongisa crossing

Figure 56: Looking downstream at Mhlongisa crossing

The Mhlongisa crossing is 800m downstream of the N2 crossing (Figure 53) with the major land use being substance agriculture and grazing of cattle. The Mhlongisa is a tributary of iSimangaliso Wetland Park (a world heritage site), which is situated 35km downstream. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems. The Mhlongisa River is an ephemeral watercourse with high flow from November to April. It should be noted that flooding occurred in July 2002 and 2004. The river channel and banks ill-defined, obstructed with dense vegetation (see Figure 55 and Figure 56).

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 9 – Mduna River, Mhlongisa KZN (Lat 27°50'40.36" S 32°10'17.02" E)

Figure 57: Aerial view Mduna River crossing.

Figure 58: Existing Mduna River bridge

Figure 59: Looking upstream at Mduna crossing

Figure 60: Looking downstream at Mduna crossing

The Mhlongisa crossing is 1.1 km downstream of the N2 crossing (Figure 57) with the major land use being substance agriculture and grazing of cattle. The Mduna is a tributary of iSimangaliso Wetland Park (a world heritage site), which is situated 60km downstream. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems. The Mduna River is an ephemeral watercourse with high flow from November to April. It should be noted that flooding occurred in July 2002 and 2004. The river channel and banks ill-defined, obstructed with dense

vegetation (see Figure 59 and Figure 60). There are signs of erosion due to fast flows and flooding during rainy season.

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 10 – Msunduzi River (Mkuze tributary), Bayala KZN (Lat 27°46'27.25" S Long 32°08'13.63" E)

Figure 61: Aerial view Msunduzi crossing

Figure 62: Existing Msunduzi bridge.

Figure 63: Looking upstream Msunduzi crossing

Figure 64: Looking downstream Msunduzi crossing

The Msunduzi crossing is 1.8 km downstream of the N2 crossing (Figure 61) with the major land use being substance agriculture and grazing of cattle. The Msunduzi is a tributary of Mkuze which flows into the iSimangaliso Wetland Park (a world heritage site), which is situated 60km downstream. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems. The Msunduzi River is an ephemeral watercourse with high flow from November to April. It should be noted that flooding occurred in July 2002 and 2004. The river channel and banks are well defined (see Figure 63 and Figure 64). Flow channel and banks eroded by cattle activity. High loads of settled sedimentation just upstream the crossing section, due to a distinct meander at this location (Figure 61).

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 11 – KwaSekene River, Mkuze KZN (Lat 27°39'47.60" S Long 32°03'41.23" E)

Figure 65: Aerial view KwaSekene crossing

Figure 66: Existing KwaSekene bridge

Figure 67: Looking upstream KwaSekene crossing

Figure 68: Looking downstream KwaSekene crossing

The KwaSekene crossing is 800 km downstream of the N2 crossing (Figure 65) with the major land use being irrigated commercial sugarcane production. The KwaSekene is a tributary of Mkuze which flows into the iSimangaliso Wetland Park. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems. The KwaSekene River is an ephemeral watercourse with high flow from November to April. It should be noted that

flooding occurred in July 2002 and 2004. The river channel and banks are ill-defined and obstructed with vegetation (see Figure 67 and Figure 68).

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 12 – Mkuze River, Mkuze KZN (Lat 27°35'38.19" S Long 32°01'05.66" E)

Figure 69: Aerial view Mkuze crossing

Figure 70: Looking upstream at Mkuze crossing

Figure 71: Looking downstream Mkuze crossing

The Mkuze crossing is 700 km downstream of the N2 crossing (Figure 69) and north of Mkuze settlement with the major land use being irrigated commercial sugarcane production. The Mkuze flows into the iSimangaliso Wetland Park. Although the new rail crossing is quite far upstream care should be taken in limiting the sediment mobilisation during construction as iSimangaliso has experienced sedimentation problems. The Mkuze River is a perennial watercourse with high flow from November to April. It should be noted that flooding occurred in July 2002 and 2004. Flow channel and banks are well defined and relatively stable, despite erosion by cattle activity, low dredging activity and fast-flowing floods. (see Figure 70 and Figure 71). During the Tropical Storm Demonia a flood peak of 5500 m3/s was estimated in January 1984 close to the proposed crossing (Kovacs, 1988).

High irrigation activity both up and downstream, but investigation showed water is supplied by small earth dams located in Mkuze river contributors. Mkuze waste-water treatment plant is 5000m downstream, with effluents discharged into the river.

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 13 – Mhlanganisi River, Nkonkoni KZN (Lat 27°30'30.87" S Long 31°57'53.69" E)

Figure 72: Aerial view Mhlanganisi River crossing

Figure 73: Looking upstream Mhlanganisi crossing

Figure 74: Looking upstream Mhlanganisi crossing

The Mhlanganisi crossing is 700m downstream of the N2 crossing (Figure 72) with the land use dominated by game and cattle farms activities. The Mhlanganisi River, flows through the Phongola Nature Reserve into the Phongolapoort Dam which is 1.3km downstream. The Mhlanganisi River is an ephemeral watercourse with high flow from November to April. Flow channel and banks ill-defined, obstructed with vegetation and eroded by fast-flows and floods (see Figure 73 and Figure 74). There are signs of erosion due to fast flows and flooding during rainy season.

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Crossing 14 – Phongolo River, Leeuspoor KZN (Lat 27°22'10.70" S Long 31°51'22.48" E)

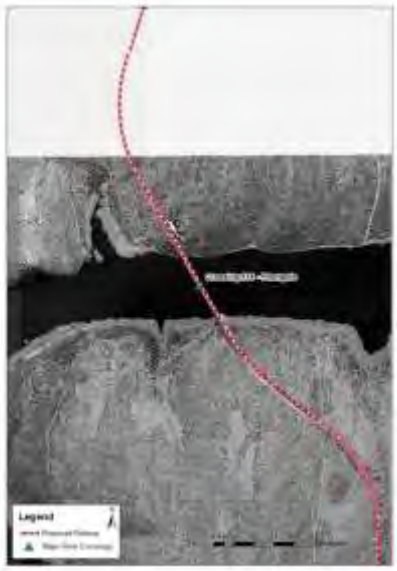

Figure 75: Aerial view Phongolo River crossing

Figure 76: Existing Phongolo bridge

Figure 77: Looking downstream Phongolo crossing

The Phongolo river crossing is 6km South-west of Golela (border post with Swaziland). The regional land use is dominated by game and cattle farm activities with some upstream irrigated agriculture. The railway crosses the Phongolo River, which flows into the Phongolo Dam, in the Phongolo Nature Reserve, just downstream. Regarding flow, the Phongolo River displays normal seasonal variability but permanent all year round. Flow channel and banks are well defined and relatively stable. During the Tropical Storm Demonia a flood peak of 13000m^3/s was recorded in January 1984 at Phongolo Dam (Kovacs, 1988). There is a small WWTP on the left riverbank, by the river crossing.

The longer term impacts will be similar to those of the existing bridges. Impacts during the construction phase include the introduction of sediment and erosion of banks. Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons during the rainfall season may have impacts on water quality in local streams and rivers.

Upgrade of the Nsezi Yard:

The Nsezi Rail Yard currently has the capacity to accommodate 200 rail wagons. It is currently used for staging and breaking up loads for the port and industrial areas in Richards Bay. The yard will be expanded by the addition of three extra rail lines. Minor earthworks will be required for this purpose. The existing fuel storage tanks and waste water separation facility are shown in Figure 78 and Figure 79 respectively.

Figure 78: Fuel storage Nsezi Yard

Figure 79: Separation tank at Nsezi Yard

Potential sources of surface water pollution at the rail yard include:

- wastewater from kitchen and ablution facilities
- wash bays and workshops
- fuelling facilities
- coal dust and rainfall seepage from the wagons.

It is recommended that monitoring be undertaken of any effluent that is discharged from the Nesezi Yard into a surface water resource such as a stream or coastal lake. If the volume of the discharge is less than 2000 cubic metres on any given day, then the effluent must comply with the general effluent standards according to Sections 21 (f) and (h) of the Revision of General Authorisations in terms of Section 39 of the National Water Act (as revised on 6 September 2013) (Government Notice No. 665). The general effluent standards are specified in Table 2.1 of the General Authorisation regulations. The effluent should be metered and records be kept of total weekly discharges, and the effluent quality should be monitored at a monthly frequency. The constituents to be monitored for depends on effluent volume that is discharged (refer Table 2.2 of the General Authorisation regulations). For a small discharge (up to 100 cubic metres) only three parameters are monitored, and more parameters for larger volumes of effluent.

If the volume of effluent discharged exceeds 2000 cubic metres per day, then a water use licence must be issued by the Department of Water Affairs and the effluent standards and monitoring conditions will be specified in the licence conditions. When wastewater or stormwater is discharged from the yard it should not result in contaminant concentrations in excess of local ambient water quality criteria (IFC, 200).

8.2.2.1 Hydrological impact assessment and mitigation

The table below describes the impacts associated with the hydrological assessments conducted by the specialist as well as mitigation measures proposed.

Table 38: Impact description for the potential disturbance, introduction of sediments or erosion of banks or channels

IMPACT DESCRIPTION: Disturbance, introduction of sediments or erosion of banks or channel				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Mobilised suspended solids released as a result of the construction activities will settle once construction is finalised. Erosion to banks is possible during construction and will naturally stabilise with time	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Impact will be restricted to the immediate surroundings of the railway yard		
Intensity	Low - negative	Impact on water quality where there is water abstraction close to the watercourse crossing as well at those crossings that are upstream of nature reserves or dams		
Probability	Fairly likely	Due to the construction activity the probabilty of this impact is fairly likely		
MITIGATION: • Sediment mobilisation can be prevented in the most part in the construction phase by the use of silt traps. • Regular cleaning of the silt traps. • Best practice culvert and bridge design practices to be followed to provide good drainage and prevent erosion and sediment mobilisation. • Upstream downstream and downstream erosion protection • In order to mitigate an increase in flow velocity, a structure to dissipate the energy maybe required. • Attention needs to be given to the prevention of bank erosion and sediment input into the stream both during construction and as a result of storm water during the operational phase.				
POST-MITIGATION				
Duration	Short-term	The implementation of the proposed mitigation measures will result in the decrease of suspended solids and erosion of stream banks	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Will be contained through the implementation of the proposed mitigation measures		
Intensity	Very low	Effective implementation of the mitigation measures will reduce the release of suspended solids and the possible erosion of water course banks		
Probability	Fairly likely	Due to the construction activity the probabilty of this impact is fairly likely, however, the potential impact will be reduced by the mitigation measures		

Table 39: Impact description for the impact of potential waste water from Nsezi Yard

IMPACT DESCRIPTION: Impact of waste water from Nsezi Yard				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Waste water will be generated during the construction and operational activities	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Impact will be within the immediate vicinity of the railway yard		
Intensity	Low - negative	Effluent will have an impact on the water resources		
Probability	Fairly likely	Generation of waste water from ablution facilities, wash bays, workshops and fueling stations can pollute the water resources		
MITIGATION: • Good practice guidelines will be followed to eliminate or minimise any waste water effluent discharges to surface waters. • Good stormwater management practices will be employed to separate clean stormwater runoff from contaminated runoff. Surface water discharges will meet waste water effluent standards. • Oily waste water will undergo treatment in an oil separator before the oil is recycled. • Monitoring is to be implemented for any effluent which is discharged.				
POST-MITIGATION				
Duration	Long-term	As per pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation		
Intensity	Very low	Appropriate mitigation will reduce the release and acccidental discharge of effluent		
Probability	Unlikely	Appropriate mitigation will reduce the release and acccidental discharge of effluent		

Table 40: Impact description for coal dust and rainfall seepage water from the coal wagons

IMPACT DESCRIPTION: Coal dust and rainfall seepage water from the coal wagons.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Suspended solids in the water might cause reduction in water quality during construction	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Water abstraction points downstream of construction will be affected		
Intensity	Low - negative	Concentration of suspended solids may impact on water quality for man and beast		
Probability	Fairly likely	Due to the construction activity the probabilty of this impact is fairly likely		
MITIGATION: • Coal should be transported using both sealed wagons and bottom dumping wagons.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Very low	Concentration of suspended solids will be reduced as a result of the mitigation measures		
Probability	Fairly likely	Due to the construction activity the probabilty of this impact is fairly likely, however, the potential impact will be reduced by the mitigation measures		

The mitigation measure in red text was found to be highly unfeasible to Transnet. This would require major operational variations to their current operational system. The time and cost required to implement this requirement would lead to a major delay in turnaround times of trains together with the subsequent economic impacts which would follow. It is the EAP's view that as the significance of the impact is determined by the specialist to be low, **the implementation of such an extravagant mitigation measure is unjustifiable. Therefore, no mitigation measures are proposed for this impact. The significance of this impact will thus remain low**.

8.2.3 Air quality assessment

The objectives of the air quality impact assessment (AIA) are to:

- Assess qualitatively the potential air quality impacts of emissions during the construction phase of the railway line and associated infrastructure.
- Assess quantitatively the potential air quality impacts of pollutants from the combustion of diesel fuel from locomotives.
- Propose mitigation measure for each phase to prevent or reduce any adverse air quality impacts on the receiving environment.

The complete air quality impact assessment report can be found in Appendix B, Annexure F.

8.2.3.1 Emissions characterisation

Emission estimates are typically the biggest uncertainty in an AIA. Since the overall objective of any AIA is to protect human and environmental health, it is important to understand that conservative estimates will be made at every step of emissions estimation. Two operational scenarios are considered. First the construction phase of the proposed project, thereafter the operational phase.

8.2.3.1.1 Construction phase of the project

The construction phase will mainly result in nuisance impacts in the form of dust. Large uncertainties are associated with emission estimates for these type of activities, resulting mostly in fugitive emissions. These factors therefore do not justify a full modelling assessment for the construction phase of this project. However, the nuisance and other possible impacts should still be managed. Best practise and possible mitigation strategies are therefore recommended for the construction activities.

It will include emissions from on-site heavy-duty off-road vehicles, other light-duty vehicles and dust emissions as a result of the construction activities. The most important emissions will be NOx from the vehicles and dust from the earthworks. It will also result in mainly nuisance impacts in the form of dust.

8.2.3.1.2 Operational phase of the project

Combustion of diesel results in the following emissions:

- · volatile organic compounds ($V\ OCs$) and other hydrocarbons (HC)
- · carbon monoxide (CO)
- · nitrogen oxides (NOx)
- · particulate matter with an aerodynamic diameter smaller than 10 μg ($PM10$)
- · particulate matter with an aerodynamic diameter smaller than 2.5 μg ($PM2.5$)
- · sulphur dioxide ($SO2$)

The pollutants of most concern and for which there exist ambient standards in South Africa include CO, nitrogen dioxide ($NO2$), $PM10$ and benzene ($C6H6$) (one of the HCs). Although $SO2$ is a pollutant of concern, the emission factors strongly depend of the fuel characteristics, which is not known, and furthermore, the contribution is likely not significant. Emissions for diesel locomotives have been quantified by the US-EPA USEPA (1989). Emissions factors for different duty cycle diesel locomotives are shown in Table 41. The different duty cycles correspond to

the age of the technology (as shown in brackets). Separate emissions standards are given for line-haul and switch mode of operation.

Table 41: USEPA Locomotive emission standards (g/bhp.hr)

Duty Cycle	HC	CO	NOx	$PM10$
Tier 0 (1973-1992)				
Line-haul	1.00	5.0	8.0	0.22
Switch	2.10	8.0	11.8	0.26
Tier 1 (1993-2004)				
Line-haul	0.55	2.2	7.4	0.22
Switch	1.20	2.5	11.0	0.26
Tier 2 (2005 – 2011)				
Line-haul	0.30	1.5	5.5	0.10
Switch	0.60	2.4	8.1	0.13
Tier 3 (2012-2014)				
Line-haul	0.30	1.5	5.5	0.10
Switch	0.60	2.4	5.0	0.10
Tier 4 (2015 or later)				
Line-haul	0.14	1.5	1.3	0.03
Switch	0.14	2.4	1.3	0.03

To calculate the total annual emissions from the diesel locomotives, the information on the number of locomotives, the annual fuel consumption rates of diesel for each train types and line types, and the mode of the locomotives operation (line-haul or switch modes) is required. The speed of operation (throttle notch), as well as the idle characteristics also have an impact on emissions. The US-EPA uses average characteristics as presented in Table 41.

A detailed analysis of the proposed design capacity was done in the pre-feasibility stage. The track design allows for a train length of 2 562m, or 200 wagons for coal and 160 wagons for general freight. Class 43 (or equivalent) type diesel electric locomotives have been assumed for the entire train service. Traction is provided by up to 6 Class 43 equivalent diesel locomotives positioned at the front, the centre and the rear of the train in Distributed Power (DP) mode.

Three terminals will be used for operations. These include Davel, Nsezi and Phuzamoya. Nsezi in Richards Bay will be the base of operations. Activities at Nsezi will include traction changes, load consolidation/distributions and fuelling. Davel will be the secondary terminal. Activities at Davel include traction changes, load consolidation/distributions and secondary fuelling. A junction terminal will be located in Phuzamoya in Swaziland. Activities at Phuzamoya will include junction and secondary fuelling.

Table 42: Throttle notch weighting factors for diesel locomotives (UNESPA, 2008)

Throttle notch	Line-haul	Switch
Idle	38.0	59.8
Dynamic brake	12.5	0.0
Notch 1	6.5	12.4
Notch 2	6.5	12.3
Notch 3	5.2	5.8
Notch 4	4.4	3.6
Notch 5	3.8	3.6
Notch 6	3.9	1.5
Notch 7	3.0	0.2
Notch 8	16.2	0.8

Trains start off in 50 wagon lengths at 20 ton axle loads during 2017. By 2020 almost all possible combinations with current wagon types are performed and 25% of coal trains run at 26 ton axle loads. By 2030 approximately 50% of all wagons are high capacity wagons running at 20 ton axle loads whilst some coal runs at 26 tons. At 2040 the majority of bulk trains run in 200 wagon lengths at 26 ton axle loads. All general freight trains then run at maximum lengths.

Coal from other areas will probably be transported in light-loaded jumbo wagons and 100 wagon blocks initially. The train axle loading and length will evolve to the maximum permissible axle loading and length over time.

A worst case scenario at full capacity is assumed for the purpose of an AIA. The maximum particle design capacity estimated scenario is shown in Table 43. Slight differences in train frequencies exist between the Davel to Phuzamoya and the Phuzamoya to Nsezi sections. For this AIA, the maximum of the two are used. A conservative estimate of 150 Ml of diesel per annum is assumed. This includes haul-line and switch mode operations.

Table 43: Maximum annual estimated fuel consumption during the operational phase

Train composition	Trains/direction/day	Litre diesel/train	Litre diesel/day	Mega litre diesel/annum
100w/20 tal	1	15 010	15 010	150
160w/20 tal	7	24 141	144 846	
200w/26 tal	8	35 089	280 712	

8.2.3.2 Proposed emissions included in the assessment

The locomotive fleet is likely older and the maintenance might not be to the same standard as those used in for testing. It is also not certain what the exact specification of the locomotives used on this rail line will be. For the purpose of the AIA, conservative estimates of operations, as well as emission factors should account for these uncertainties. The AIA therefore models two scenarios: scenario A assumes old, badly maintained tier 0 locomotives and scenario B assumes new locomotives with the best available emission control technology, or tier 4. This approach provides the absolute worst possible impact as well as the benefits obtainable from using best available technology. The final set of emission factors used for modelling the two scenarios are shown in Table 43. It is further assumed that 15% of fuel is spent on switch mode operations an 85% for line haul. Combining the

emission factors in Table 44 with the fuel estimates in Table 44 leads to total estimated annual emissions for the peak of operations (Table 45). Annual contributions of 13307 T/annum NOx, 336 T/annum $PM10$, 673 T/annum hydro carbons and 4394 T/annum CO makes up a significant portion of the national budget for the worst case scenario.

Table 44: Locomotive emission estimates used in this analysis (g/l)

Duty Cycle	NO_x	PM_{10}	HC	CO
Scenario A (worst case)				
Line-haul	83.5	2.1	4.1	27.5
Switch	95.6	2.4	5.5	32.1
Scenario B (mitigated)				
Line-haul	0.14	1.5	1.3	0.03
Switch	0.14	2.4	1.3	0.03

Table 45: Total estimated annual emissions for the peak operations of the Swazi Rail Link (T/annum)

Scenario	NO_x	PM_{10}	HC	CO
A: Worst-case	13 307	336	673	4394
B: Mitigated	1 070	24	116	1318

8.2.3.3 Baseline air quality assessment

The rail line runs through KwaZulu-Natal's East coast past many low income villages and towns. Domestic burning is a common source of pollution. Typical diurnal patterns driven by domestic cooking and heating are visible in the diurnal distribution. Isolated high peaks in CO and SO_2 suggest an impact for industry and biomass burning in the area. CO values are relatively low and below the national guidelines. Particulate matter PM (PM_{10} and $PM_{2.5}$), NO_x and SO_2 are especially high during times of domestic burning.

It is evident that the ambient concentrations of pollutants in low income areas are poor. Even isolated villages are expected to have high PM values. Any contribution to ambient PM and NO_x would therefore be significant.

The following tables indicate the impact description together with the proposed mitigation measures for the impacts relative to air quality for the railway line.

Table 46: Impact description for the release of dust from earthworks

IMPACT DESCRIPTION: Dust releases from earthworks				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Particulate matter will be produced during the construction phase	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Be restricted to the immediate vicinity of the site		

Intensity	High - negative	Dust emissions as a result of the construction activities which will mainly be as nuisance impacts		
Probability	Fairly likely	Due to the activities associated with construction dust will be generated		

MITIGATION:

Standard mitigation measures are recommended for the construction phase. These include:

- Use of enclosures, screens and sheeting to contain dust
- Use of paved / surfaced and cleaned haul routes
- Use of water suppression and wheel washing
- Choice of location and facilities for site storage where required
- Location of dust generating activities
- Transport route selection and location
- No burning on site and close to settlements
- Conduct any slash burning (glossary term) in compliance with open burning permit requirements
- Minimize the amount of disturbance and areas cleared of vegetation
- Revegetate disturbed areas as soon as possible after disturbance
- Use dust abatement techniques on unpaved, unvegetated surfaces
- Enact fugitive dust and vehicle emission controls
- Establish and enforce speed limits to reduce airborne fugitive dust
- When feasible, shut down idling construction equipment
- Keep soil moist while loading into dump trucks to minimize fugitive dust
- Keep soil loads below the freeboard of the truck to minimize fugitive dust
- Minimize drop heights when loaders dump soil into trucks
- Tighten gate seals on dump trucks
- Cover dump trucks before traveling on public roads
- When possible, schedule construction activities during periods of low winds to reduce fugitive dust

POST-MITIGATION

Duration	Short-term	As per pre-mitigation	Consequence: Slightly detrimental	Significance: Very low
Extent	Local	As per pre-mitigation		
Intensity	Low - negative	Mitigation measures will reduce the intensity		
Probability	Unlikely	The implementation of the proposed mitigation measures will reduce the probability of the impact		

The mitigation measure highlighted in red has been included in the EMP as well. **However, an alternative for this mitigation measure has also been proposed by the EAP:** Dump trucks that cannot be covered may only be filled up to 80 % capacity when travelling on public roads to prevent spillage onto public roads as well as subsequent dust related to this activity.

Table 47: Impact description of vehicle exhaust during construction

IMPACT DESCRIPTION: Construction vehicle exhaust				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Emissions of mainly NO_2 from on-site heavy-duty off-road vehicles and other light-duty vehicles will occur during the construction phase	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Emissions will be restricted to the immediate vicinity of the construction activities		
Intensity	High - negative	The emissions will have a nuisance value		
Probability	Fairly likely	Due to the activities associated with construction exhaust emissions will be generated		
MITIGATION: Standard mitigation measures are recommended for the construction phase. These include: • Transport route selection and location • Enact fugitive dust and vehicle emission controls • Establish and enforce speed limits to reduce airborne fugitive dust • When feasible, shut down idling construction equipment • Tighten gate seals on dump trucks				
POST-MITIGATION				
Duration	Short-term	As per pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation		
Intensity	Very low	Mitigation will reduce the intensity of the impact		
Probability	Fairly likely	Due to the activities associated with construction exhaust emissions will be generated		

Table 48: Impact description for the contribution of the proposed project to the ambient CO

IMPACT DESCRIPTION: Contribution to ambient CO				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Combustion of diesel will result in release of carbon monoxide	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Impact will be localised		
Intensity	Moderate - negative	Calculated release is well below ambient standard		
Probability	Very likely	Combustion of diesel will result in release of carbon monoxide		
MITIGATION: • Huge reduction in emissions from diesel locomotives can be achieved by upgrading the engines • Maintenance of the locomotives				
POST-MITIGATION				
Duration	Medium-term	As per pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation		
Intensity	Very low	Implementation of the mitigation measures will reduce the release of carbon monoxide		
Probability	Unlikely	Implementation of mitigation measures will greatly reduce the probability of the impact		

Table 49: Impact description for the contribution to ambient PM_{10}

IMPACT DESCRIPTION: Contribution to ambiet PM10				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Combustion of diesel will result in release of particulate matter	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Impact will be localised		
Intensity	High - negative	Ambient concentration of PM in low income areas are poor and even isolated villages will have a high PM. Release of particulate matter will contribute to this will have a significant impact at local level		
Probability	Very likely	Combustion of diesel will result in release of particulate matter		
MITIGATION: • Huge reduction in emissions from diesel locomotives can be achieved by upgrading the engines • Maintenance of the locomotives				
POST-MITIGATION				
Duration	Short-term	Mitigation will reduce the duration of the impact	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation		

Intensity	Very low	Release of partuclate matter will be reduced to almost zero through the implementation of appropriate mitigation measures		
Probability	Unlikely	Release of particulate matter will be reduced		

Table 50: Impact description for the contribution to ambient NO_2

IMPACT DESCRIPTION: Contribution to ambient NO2				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Combustion of diesel will result in release of nitrogen oxides	Consequence: Highly detrimental	Significance: High - negative
Extent	Regional	Distribution of the plume could result in a regional impact		
Intensity	High - negative	Nitrogen oxide pollution have an impact on human health		
Probability	Very likely	Combustion of diesel results in the release of nitrogen oxides		
MITIGATION: • Huge reduction in emissions from diesel locomotives can be achieved by upgrading the engines • Maintenance of the locomotives				
POST-MITIGATION				
Duration	Short-term	Combustion of diesel will result in release of nitrogen oxides	Consequence: Negligible	Significance: Very low
Extent	Local	Distribution of the plume could result in a regional impact		
Intensity	Very low	Implementation of appropriate mitigation measures will reduce the level of nitrogen oxides		
Probability	Unlikely	Combustion of diesel results in the release of nitrogen oxides albeit at a much reduced level		

Table 51: Impact description for the contribution to ambient C_6H_6

IMPACT DESCRIPTION: Contribution to ambient C6H6				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Combustion of diesel will result in release of hydro carbons	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Impact will be localised		
Intensity	Moderate - negative	Hydro carbon pollution could have an impact on human health		
Probability	Very likely	Combustion of diesel will result in release of hydro carbons		
MITIGATION: • Huge reduction in emissions from diesel locomotives can be achieved by upgrading the engines • Maintenance of the locomotives				
POST-MITIGATION				
Duration	Short-term	Combustion of diesel will result in release of hydro carbons	Consequence: Negligible	Significance: Very low
Extent	Local	Impact will be localised		
Intensity	Very low	The release of hydro carbons will be reduced to below the ambient standard		
Probability	Unlikely	Combustion of diesel will result in release of hydro carbons		

8.2.4 Geohydrological assessment

The project consists of the construction and upgrade of the railway line from Golela to Nsezi, as well as the upgrading of the existing Nsezi Yard.

Golela to Nsezi Rail Upgrade:

Only a geohydrological desk study for this portion was required. The tasks consisted of the following:

- Reconnaissance Trip & Desk study, and
- Reporting.

The Golela to Nsezi section of the Transnet Swazi Rail Link is divided into four sections according to the geohydrological boundaries as described in the 1: 500 000 Hydrogeological Map (Vryheid 2730) underlying the route. The physical attributes hereof are described in the following table according to this arrangement.

Chainage (km)	Hydrogeological Unit[1]	Geological Description	Aquifer Description	Potential Yield (l/s)
380 – 419 (Portion 1)	D2	Mafic extrusive rocks (Basalt)	Fractured and Intergranular	0.1 – 0.5
419 – 486 (Portion 2)	D3	Mafic extrusive rocks (Basalt)	Fractured and Intergranular	0.5 – 2.0
486 – 490; 492 – 495 (Portion 3)	D1	Predominantly argillaceous rocks (shale and siltstone)	Fractured and Intergranular	0.0 – 0.1
490 – 492; 495 – 576 (Portion 4)	A3	Unconsolidated coastal deposits	Intergranular	0.5 – 2.0

Since the majority of the Golela - Nsezi section of the rail link is located in the rural areas of KwaZulu-Natal, it can be assumed that groundwater is mainly used for domestic purposes and stock watering.

From the Geohydrological Impact Assessment it can be seen that the construction and operational phases of the railway line between Golela and Nsezi will have a “very low” impact on the investigated geohydrological environment, given that sound environmental infrastructure and management procedures are put in place. All of the identified impacts could be countered by appropriate mitigation.

Nsezi Yard Upgrade:

The existing Nsezi Yard will be upgraded which will include amongst other, the upgrade of the existing fuel farm. As part of the Nsezi Yard upgrade, the fuel farm per se was identified as potentially having the greatest impact on the geohydrological environment in the event of a fuel spill. Therefore, the detailed baseline groundwater study focussed on this area.

As a requirement for the environmental authorizations for the project, a geohydrological study was undertaken to determine the baseline geohydrological conditions of the site. This report details the approach and methodology of the geohydrological study to describe the baseline conditions in order to quantify potential impacts and to develop a groundwater management framework to mitigate identified potential impacts.

[1] According to the 1:500 000 Hydrogeological Map (2730 Vryheid)

The investigation consisted of the following:

- Desk study & Hydrocensus;
- Borehole siting taking existing infrastructure and local drainage into account;
- Appointment of a drilling contractor and supervising the drilling of 3 monitoring boreholes;
- Hydraulic testing & chemical analysis of the newly drilled boreholes; and
- Report on the findings, perform an impact assessment and develop a monitoring program.

The specialist assessment report for the geohydrological studies conducted can be found in Appendix B, Annexure B. The summary of the impact assessment findings are discussed below.

Based on the 1:250 000 geological map (2732 St. Lucia), the site is underlain by Quaternary redistributed sand. According to King (2003) the unconsolidated Quaternary sands mostly comprise of fine to medium grained material with localised coarser grained layers. It is these coarser grained layers which can produce significant amounts of groundwater. Groundwater is also found in the finer sand, although its lower transmissivity reduces its potential. Most aquifers in this Group are unconfined to semi-confined. Groundwater levels are generally shallow (<10m) in low lying areas and 50% of boreholes have groundwater levels less than 15m below ground level. The likelihood of drilling a successful borehole in these aquifers is very good, usually greater than 95%.

A hydrocensus was carried out on the 15th of November 2013 within the yard site area, as well as the adjacent properties to identify legitimate groundwater users, the groundwater potential and quality. No boreholes could be found on the adjacent land, while a total of 7 boreholes were identified within the Nsezi Yard area. The Nsezi Yard makes use of municipal water and the identified boreholes were drilled for monitoring purposes only. All 7 of the boreholes were found to be dry.

Installation of additional monitoring boreholes around the fuel farm was conducted by Kwa-Natal Drilling using the mud rotary drilling method. One up- and two downstream monitoring boreholes were drilled from the 13th to the 15th of November 2013. The boreholes were drilled down to a depth of 30m and delivered with 125 mm PVC casing, gravel pack, bentonite seal, concrete plinth and cap. Solid casing was installed in the upper 1m, together with the bentonite sanitary seal. Perforated (slotted) casing and a gravel pack was installed in the remainder of the borehole in order to allow seepage into the borehole. From the drilling logs it can be concluded that the site is underlain by sand, sandy clay and clay. The upstream boreholes proved to have a yield more significant than seepage while only seepage was observed in the 2 downstream monitoring boreholes.

Falling head tests (“slug tests”) were carried out on the newly drilled boreholes. Data acquired from the “slug tests” was used to calculate the hydraulic conductivity (K) used in the calculation of the flow velocity of groundwater on-site. Based on the results of the “slug tests” and using Darcy’s flow equation it was calculated that potential pollutants originating from the fuel farm and seeping into the groundwater would migrate at an estimated rate of ~2.53 x 10^{-9} m/d towards the Nseleni River.

Pumped groundwater samples were collected for chemical analysis from the 3 newly drilled boreholes on the 15th of November 2013. The water quality in boreholes NS-BH 1 & 3 fall within the Class 1 drinking water standards. NS-BH2 falls within the Class 2 drinking water standards due to elevated Na, Fe, and Al concentrations. Apart from the groundwater samples taken for inorganic analysis, floating bailed samples were also taken from each newly drilled borehole and submitted for a Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) screening. No detectable traces of GRO & DRO’s were reported in boreholes NS-BH1 & 2. Detectable traces of

GRO's in the form of Benzene & Naphthalene, as well as detectable traces of DRO's were reported in downstream monitoring borehole NS-BH 3, indicating on diesel/petrol contaminated groundwater.

The aquifer(s) underlying the Nsezi Yard were classified in accordance with "A South African Aquifer System Management Classification, December 1995" by Parsons. Based on information collected during the hydrocensus it can be concluded that aquifer system in the study area can be classified as a "Minor-Aquifer System". The local population are not dependant on groundwater. The aquifer is however important for supplying baseflow to the local river and its tributaries.

Based on the field work and interpretation of available and newly acquired data, the (1) Construction and upgrade of the railway line from Golela to Nsezi, and (2) Upgrade of the Nsezi Yard and Fuel Farm, will have a "very low" impact on the investigated geohydrological environment, given that sound environmental infrastructure and management procedures are put in place. During the rating and ranking procedure of impacts, all identified impacts could be countered by appropriate mitigation. The impact description and accompanying mitigation measures can be found in the following table:

Table 52: Impact description for the possible contamination of groundwater by contaminated ballast stone

IMPACT DESCRIPTION: Contaminated ballast stone may lead to contamination of groundwater.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Contamination of groundwater resources as a result of hydrocarbon runoff from contaminated poses a long term threat	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Local	Plumes migrate off-site		
Intensity	Very high - negative	Hydrocarbon contamination poses a serious health risk		
Probability	Fairly likely	Hydrocarbon spills on ballast stones is failrly likely resulting in a contamination of groudwater		
MITIGATION: • Ballasts should be cleaned every 3 to 4 years by the use of a ballast cleaner • Ballast cleaning should involve the removal of worn ballasts with the replacement of new ballasts				
POST-MITIGATION				
Duration	Short-term	Hydrocarbon contamination of water resources will be contained thereby reducing the impact on the water resources	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Reduction of hydrocarbon contamination will restrict impact to specific sites		
Intensity	Very low	No contamination of aquifers		
Probability	Unlikely	Contamination will be contained and restricted		

Table 53: Impact description for the potential contamination of groundwater by spillages of hazardous materials resulting from accidents or collisions

IMPACT DESCRIPTION: Spillages of hazardous materials resulting from accidents or collisions may result in contamination of groundwater.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Contamination of aquifers poses a long term threat	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Local	Plumes migrate off-site		
Intensity	Very high - negative	Poses serious health risks		
Probability	Fairly likely	Accidents and contamination is fairly likely due to human nature		
MITIGATION: • The construction of the workshops, cleaning bays and fuel dispensing areas should be in such a way that no accidental spillages leave the site and surface and storm water run-off be diverted through an oil/water separator before leaving the site. • Emergency spill kits should always be present at strategic locations with capable people with the necessary training available to use it in the case of accidental spillages.				
POST-MITIGATION				
Duration	Short-term	Spillages are contained and threat will be short term	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Spillages will be contained		
Intensity	Very low	No contamination of aquifers		
Probability	Unlikely	Spillages will be contained and contamination restricted		

Table 54: Impact description for the potential contamination of groundwater due to hydrocarbon spillages from equipment, machinery and vehicle storage

IMPACT DESCRIPTION: Nsezi Yard: Potential hydrocarbon spillages from equipment, machinery and vehicle storage may lead to contamination of groundwater.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Contamination of water resources could pose a long term health risk	Consequence: Highly detrimental	Significance: Very low
Extent	Local	Plumes migrate off-site		
Intensity	Very high - negative	Poses a serious health risk		
Probability	Fairly likely	Contamination is fairly likely due to human error		
MITIGATION: • Fuel Storage Tanks should be installed according to the relevant SABS standards, for example SABS 089, 1535, 0131, 0108 and 0400. These standards make provision for observation wells, leak detectors, overfill protectors, etc. • The construction of the workshops, cleaning bays and fuel dispensing areas should be in such a way that no accidental spillages leave the site and surface and storm water run-off be diverted through an oil/water separator before leaving the site. • Emergency spill kits should always be present at strategic locations with capable people with the necessary training available to use it in the case of accidental spillages. • A groundwater monitoring program as outlined in the EMP should be implemented to monitor the impact of the Rail Yard and Fuel Farm on the geohydrological environment. • Should it become evident from the monitoring program that pollution of the groundwater environment occurs, corrective and remedial actions should be implemented. • Ground water monitoring network must be dynamic (ie adaptable)				
POST-MITIGATION				
Duration	Short-term	Aquifers will not be contaminated	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Spillages will be contained		
Intensity	Very low	No contamination of aquifers		
Probability	Unlikely	Mitigation will reduce the potential for spillages and contamination		

Table 55: Impact description for the potential contamination of groundwater from waste leakages / spillages in construction camps

IMPACT DESCRIPTION: Nsezi Yard: Potential waste leakages / spillages in construction camp may lead to contamination of groundwater.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Contamination of surface water resources could have a long term impact on groundwater	Consequence: Highly detrimental	Significance: Very low
Extent	Local	Will be restricted to local impact		
Intensity	Very high - negative	Contaminated groundwater could pose a serious health risk		
Probability	Fairly likely	Contamination is likely due to human error		
MITIGATION:				

• Fuel Storage Tanks should be installed according to the relevant SABS standards, for example SABS 089, 1535, 0131, 0108 and 0400. These standards make provision for observation wells, leak detectors, overfill protectors, etc. • The construction of the workshops, cleaning bays and fuel dispensing areas should be in such a way that no accidental spillages leave the site and surface and storm water run-off be diverted through an oil/water separator before leaving the site. • Emergency spill kits should always be present at strategic locations with capable people with the necessary training available to use it in the case of accidental spillages. • A groundwater monitoring program as outlined in the EMP should be implemented to monitor the impact of the Rail Yard and Fuel Farm on the geohydrological environment. • Should it become evident from the monitoring program that pollution of the groundwater environment occurs, corrective and remedial actions should be implemented. • Ground water monitoring network must be dynamic (ie adaptable)				
POST-MITIGATION				
Duration	Short-term	Contamination of water resources will be contaied before aquifers are affected	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Contamination will be contained		
Intensity	Very low	Contamination will be contained resulting in low impact		
Probability	Unlikely	Mitigation will greatly reduce the impact of waste and spillage contamination of water resources		

Table 56: Impact description for the potential contamination of groundwater from windblown material emanating from uncovered rail trucks

IMPACT DESCRIPTION: Windblown material emanating from uncovered rail trucks may result in contamination of groundwater.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Contamination of aquifers poses a long term threat	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Local water resources may be contaminated resulting in contamination of aquifers		
Intensity	Moderate - negative	Contamination of water resources with hazardous material could lead to health risks		
Probability	Fairly likely	Contamination of water resources by material emanating from uncovered wagons is fairly likely due to the nature of the material being transported		
MITIGATION: • Coal should be transported using both sealed wagons and bottom dumping wagons				
POST-MITIGATION				
Duration	Short-term	Contamination of water resources will be prevented therefore restricting the potential impact of contamination	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Potential impacts will be contained at will only have an impact at at site level		
Intensity	Very low	Contamination of water resources will be contained therefore restricting the potential impact of contamination		

Probability	Unlikely	Implementation of appropriate mitigating measures will severely reduce the potential of contamination of water resources	

The mitigation measure in red text was found to be highly unfeasible to Transnet. This would require major operational variations to their current operational system. The time and cost required to implement this requirement would lead to a major delay in turnaround times of trains together with the subsequent economic impacts which would follow. It is the EAP's view that as the significance of the impact is determined by the specialist to be low, **the implementation of such an extravagant mitigation measure is unjustifiable. Therefore, no mitigation measures are proposed for this impact. The significance of this impact will thus remain low**.

8.3 Impacts on the Physical Environment

8.3.1 Noise and vibration assessment

Enviro Acoustic Research conducted the noise and vibration specialist assessments for the project. Their specialist report can be found in Appendix B, Annexure G.

The word "noise" is generally used to convey a negative response or attitude to the sound received by a listener. There are four common characteristics of sound, any or all of which determine listener response and the subsequent definition of the sound as "noise". These characteristics are:

- Intensity;
- Loudness;
- Annoyance; and
- Offensiveness.

Of the four common characteristics of sound, intensity is the only one which is not subjective and can be quantified. Loudness is a subjective measure of the effect sound has on the human ear. As a quantity it is therefore complicated, but has been defined by experimentation on subjects known to have normal hearing.

The annoyance and offensive characteristics of noise are also subjective. Whether or not a noise causes annoyance mostly depends upon its reception by an individual, the environment in which it is heard, the type of activity and mood of the person and how acclimatised or familiar that person is to the sound.

Initial daytime (06:00 – 22:00) and night-time (22:00 – 06:00) operations were assessed during the study. Most critical investigational times would be the night-time hours when a quiet environment is desired (at night for sleeping, weekends etc.).

At future dates (taken as 15 years in this study) the capacity of train trips, carriages and locomotives will increase. Assessment for future daytime (06:00 – 22:00) and night-time (22:00 – 06:00) operations were also addressed.

Calculations in this section are based on a worst-case scenario and will not be relevant for all times of the development operations. It is based on peak hours (over a 1 hour equivalent period).

Measurements and site investigation were conducted from the 10th September till the 13th September 2013 as well as from the 28th till the 29th September 2013. Potentially sensitive receptors, also known as noise-sensitive developments (NSDs) were identified up to 200 m from the railway line. Receptors locations were identified using

tools such as Google Earth® and other available internet resources and information. Potential receptors around the development were classified between NSD1437 to NSD1523 as well as five separate communities. The following rating levels are proposed for receptors in the study area:

- The Equator Principle IFC guideline with a 55 and 45 dBA day/night time rating level for receptors.

8.3.1.1 Vibrations

South African Standards available are limited to the SABS ISO 4866:1990 and SABS ISO 2631-1 1991. These documents are based on human and building infrastructure that is exposed to vibrations. It is a trend in African countries to refer to International Standards and guidelines in terms of vibration criteria.

Infrastructure vibrations predominately occur below 300 Hz, with many International guidelines highlighting the need to consider the measurement frequency weighting when assessing vibrations. These include the international W_m/KB and British W_b/W_d standards, vibration decibel (VdB) measurements as well as the correlation between $\mathbf{L_{Aeq}}$ and $\mathbf{L_{Ceq}}$ for assessment of lower frequencies [2] (refer to Section 2.5 of the Noise and Vibration specialist report for SANS methodology).

A ground-borne vibration is a system interlinking the noise source, vibration medium and receiver with one another. Several different mechanisms constitute this system including the distances, infrastructure specifications and railway *modus operandi*.

This report will only investigate airborne noise disturbances motivated by the following reasons:

- Vibration decibel's international criterion for annoyance includes the amount of trains per day and is generally based on railways used for commuting purposes. International countries where railways are used for commuting purposes is a far busier and more complex system than what is required from this proposed industrial route;
- International documents based on commuter trains do focus a fair amount on built-up dense urban environments whereby potential vibration annoyance may increase. This proposed railway route assessment is in a fairly rural area when considering the surrounding land use;
- International guidelines also take into account high speed commuter trains, with commuter trains that can reach a velocity of a maximum of 200 km/h[3]. This proposed industrial route will have trains operating at 40 km/h near sensitive areas. The levels of ground-borne vibration and noise vary approximately 20 times the logarithm of speed. This means that doubling train speed will increase the vibration levels approximately 6 decibels and halving train speed will reduce the levels by 6 decibels. Due to the directly proportional relationship between vibration and noise, the lower the rolling stock speeds the less likely there will be for a vibration annoyance[4];
- Ground-borne noise mainly applies at receiver locations above rail operations in tunnels where ground-borne noise levels from rail transport are likely to be greater than airborne noise levels (and at speed). This is particularly relevant internationally for commuter underground subway systems. Air-borne noise generally is far more annoying to a receptor than ground-borne vibrations;
- Only limited research into the impacts of ground-borne noise is available, and information and modelling on practices applied overseas is scarce[5]. There is currently no accepted model available to allow the extent of vibration and ground-born noise from railway vehicles. Such efforts as the CATdBTren[6] and ENVIB[7]

[2] RIVAS. Review of existing standards, regulations and guidelines, as well as laboratory and field studies concerning human exposure to vibration. 2011.

[3] http://en.wikipedia.org/wiki/High-speed_rail

[4] High-Speed Ground Transportation Noise and Vibration Impact Assessment.1998.

[5] M.J Griffin. The Handbook of Human Vibration. 1996

[6] The Sixteenth International Congress of Sound and Vibration. Krakow. 2009.

[7] Mehdi Bahrekazemi. Train-Induce Ground Vibration and its Prediction.2004

projects whereby empirical calculations are proposed for the prediction of the complex ground-borne vibration;

- A ground-borne vibration is proportional of the distance from noise source to the receiver. Refer to Figure 80 for such an example (based on an underground subway system, example only). In this instance, not all receptors in the study area are adjacent to the proposed railway line;
- Many proposed mitigation measures for consideration in this document due to air-borne noise will similarly influence ground vibrations[8]. Refer to Table 57 indicating the likely corrections that can be achieved to reduce both air and ground-borne vibrations simultaneously, and was considered for the air-borne acoustical mitigation section of this document[9]. Continuous welded rails and wheel maintenance is important for both air and ground-borne vibration reductions. Wheel flat spots can be generated when trains slide over the tracks. The wheel flat spots will similarly influence the increase in audible acoustics as well as ground-borne vibrations due to the clunking effect of the lack of symmetry of wheel radii. The maintenance of the wheel will thus benefit both air and ground-borne acoustics; and
- There are many factors involved in the sophisticated estimation of vibration and ground-borne vibration, including:
    1. The medium - The surrounding geological strata, bedrock depth, soil type, bedrock contours, soil layering, depth of the water table etc.;
    2. The source - Condition of the track, design of the track, speed of the locomotive and carriage, track support, suspension, track alignment, weight of cargo, condition of the rail track and wheel, wheel axles etc.; and
    3. The receiver – Receptor's foundation design, building construction, interior acoustical absorption and location of building etc.

It must be noted that due to the high level of uncertainties of the geology in relation to the railway line, an individual's unique infrastructure and foundation specifications, it cannot be guaranteed that ground-borne vibrations will meet international criteria at all dwellings. An unlikely situation may arise whereby a receptors dwelling may be located in an ideal setting whereby vibrations may be easily transmitted to the surrounding environment.

[8] High-Speed Ground Transportation Noise and Vibration Impact Assessment.1998.

[9] High-Speed Ground Transportation Noise and Vibration Impact Assessment.1998.

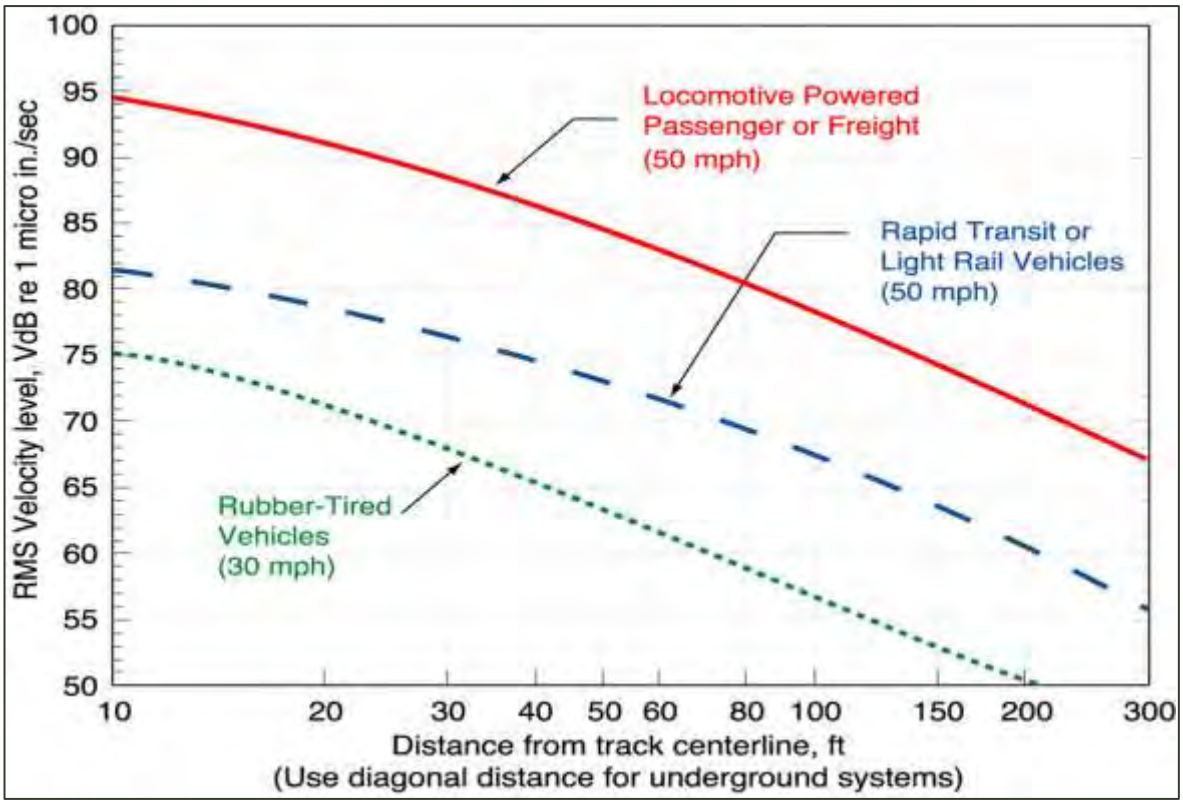

Figure 80: Trains speed vs VdB (underground subway system)

Table 57: Adjustment factors, railway noise and vibration

Factors Affecting Vibration Source

Source Factor	Adjustment to Propagation Curve			Comment
		Reference Speed		
Speed	Vehicle Speed	50 mph	30 mph	Vibration level is approximately proportional to 20*log(speed/speed$_{ref}$). Sometimes the variation with speed has been observed to be as low as 10 to 15 log(speed/speed$_{ref}$).
	60 mph	+1.6 dB	+6.0 dB	
	50 mph	0.0 dB	+4.4 dB	
	40 mph	-1.9 dB	+2.5 dB	
	30 mph	-4.4 dB	0.0 dB	
	20 mph	-8.0 dB	-3.5 dB	
Vehicle Parameters (not additive, apply greatest value only)				
Vehicle with stiff primary suspension	+8 dB			Transit vehicles with stiff primary suspensions have been shown to create high vibration levels. Include this adjustment when the primary suspension has a vertical resonance frequency greater than 15 Hz.
Resilient Wheels	0 dB			Resilient wheels do not generally affect ground-borne vibration except at frequencies greater than about 80 Hz.
Worn Wheels or Wheels with Flats	+10 dB			Wheel flats or wheels that are unevenly worn can cause high vibration levels. This can be prevented with wheel truing and slip-slide detectors to prevent the wheels from sliding on the track.
Track Conditions (not additive, apply greatest value only)				
Worn or Corrugated Track	+10 dB			If both the wheels and the track are worn, only one adjustment should be used. Corrugated track is a common problem. Mill scale on new rail can cause higher vibration levels until the rail has been in use for some time.
Special Trackwork	+10 dB			Wheel impacts at special trackwork will significantly increase vibration levels. The increase will be less at greater distances from the track.
Jointed Track or Uneven Road Surfaces	+5 dB			Jointed track can cause higher vibration levels than welded track. Rough roads or expansion joints are sources of increased vibration for rubber-tire transit.
Track Treatments (not additive, apply greatest value only)				
Floating Slab Trackbed	-15 dB			The reduction achieved with a floating slab trackbed is strongly dependent on the frequency characteristics of the vibration.
Ballast Mats	-10 dB			Actual reduction is strongly dependent on frequency of vibration.
High-Resilience Fasteners	-5 dB			Slab track with track fasteners that are very compliant in the vertical direction can reduce vibration at frequencies greater than 40 Hz.

Factors Affecting Vibration Path

Path Factor	Adjustment to Propagation Curve			Comment
Resiliently Supported Ties	-10 dB			Resiliently supported tie systems have been found to provide very effective control of low-frequency vibration.
Track Configuration (not additive, apply greatest value only)				
Type of Transit Structure	Relative to at-grade tie & ballast:			The general rule is the heavier the structure, the lower the vibration levels. Putting the track in cut may reduce the vibration levels slightly. Rock-based subways generate higher-frequency vibration.
	Elevated structure	-10 dB		
	Open cut	0 dB		
	Relative to bored subway tunnel in soil:			
	Station	-5 dB		
	Cut and cover	-3 dB		
	Rock-based	- 15 dB		
Ground-borne Propagation Effects				
Geologic conditions that promote efficient vibration propagation	Efficient propagation in soil	+10 dB		Refer to the text for guidance on identifying areas where efficient propagation is possible.
	Propagation in rock layer	Dist.	Adjust.	The positive adjustment accounts for the lower attenuation of vibration in rock compared to soil. It is generally more difficult to excite vibrations in rock than in soil at the source.
		50 ft	+2 dB	
		100 ft	+4 dB	
		150 ft	+6 dB	
		200 ft	+9 dB	
Coupling to building foundation	Wood Frame Houses	-5 dB		The general rule is the heavier the building construction, the greater the coupling loss.
	1-2 Story Masonry	-7 dB		
	3-4 Story Masonry	-10 dB		
	Large Masonry on Piles	-10 dB		
	Large Masonry on Spread Footings	-13 dB		
	Foundation in Rock	0 dB		

Factors Affecting Vibration Receiver

Receiver Factor	Adjustment to Propagation Curve		Comment
Floor-to-floor attenuation	1 to 5 floors above grade:	-2 dB/floor	This factor accounts for dispersion and attenuation of the vibration energy as it propagates through a building.
	5 to 10 floors above grade:	-1 dB/floor	
Amplification due to resonances of floors, walls, and ceilings	+6 dB		The actual amplification will vary greatly depending on the type of construction. The amplification is lower near the wall/floor and wall/ceiling intersections.
Conversion to Ground-borne Noise			
Noise Level in dBA	Peak frequency of ground vibration:		Use these adjustments to estimate the A-weighted sound level given the average vibration velocity level of the room surfaces. See text for guidelines for selecting low, typical or high frequency characteristics. Use the high-frequency adjustment for subway tunnels in rock or if the dominant frequencies of the vibration spectrum are known to be 60 Hz or greater.
	Low frequency (<30 Hz):	-50 dB	
	Typical (peak 30 to 60 Hz):	-35 dB	
	High frequency (>60 Hz):	-20 dB	

8.3.1.1.1 Vibrations – International Regulations and Guidelines

International guidelines available for vibrations include the ISO 2631-1:1997, ISO8041:2005, Austrian ÖNORMS S 9012: 2010, German DIN4150-2:1999, American ANSI S3.29-1983 etc. These standards are measurement-based methodologies recommending units and weighting corrections that can be used in a measured scenario. The descriptor used for structural vibration damage is the Peak Particle Velocity unit (PPV. in/sec), while potential vibration annoyance is expressed in vibration decibels (VdB), a root mean square calculation.

Europe, Australia and other countries make use of railway lines for multiple purposes and not just industrial use, with commuting rail infrastructure far more advanced than what is available in South Africa. The magnitude of trains due to rail commuting in mentioned countries far exceeds the trip volume as proposed for this acoustical assessment. A staggering example is the 1.3 billion commuter journeys made by rails annually in the United Kingdom, with 575,000 trains alone from towns/cities traversing into London[10]. In comparison a paltry 8 trains is envisaged operations on this assessed rail route (initial volume).

As such the VdB criterion is a correction based on the amount of train passages near a receptor as well as the magnitude of trains per day/night period. The magnitude of trains that pass-by is defined as either infrequent or frequent events. Infrequent events can be classed as “fewer than 70 vibrations a day”. This criterion is defined in Figure 81. Furthermore a correction based on the type noise receiver is implemented. The limits for the three land uses applicable for vibrational assessments are:

1. Buildings where a low ambient vibration is essential – Refer to Figure 82;
2. Residential dwellings where a peaceful environment is sought for rest; and
3. Institutional land use.

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent[1] Events	Infrequent[2] Events	Frequent[1] Events	Infrequent[2] Events
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[3]	65 VdB[3]	-4	-4
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Notes:

1. "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
4. Vibration-sensitive equipment is not sensitive to ground-borne noise.

Figure 81: Ground-bourne vibration criteria

[10] Networkrail.co.uk.

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro-Pascals)	
	Frequent[1] Events	Infrequent[2] Events	Frequent[1] Events	Infrequent[2] Events
Concert Halls	65 VdB	65 VdB	25 dBA	25 dBA
TV Studios	65 VdB	65 VdB	25 dBA	25 dBA
Recording Studios	65 VdB	65 VdB	25 dBA	25 dBA
Auditoriums	72 VdB	80 VdB	30 dBA	38 dBA
Theaters	72 VdB	80 VdB	35 dBA	43 dBA

Notes:
1. "Frequent Events" is defined as more than 70 vibration events per day. Most transit projects fall into this category.
2. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. If the building will rarely be occupied when the trains are operating, there is no need to consider impact. As an example consider locating a commuter rail line next to a concert hall. If no commuter trains will operate after 7 pm, it should be rare that the trains interfere with the use of the hall.

Figure 82: Ground-bourne vibration criteria for special buildings

8.3.1.1.2 Secondary vibrations – wind and air-borne infrastructure vibration

Buildings can be classified into two categories with regards to wind-induced vibration; vibration sensitive (flexible) and Vibration Insensitive (Rigid). The height of the building is directly proportional the vibration sensitivity of the building. As such, skyscrapers make use of large mass-tuned dampers to act as a ballast or counter-weight in relation to opposing wind shear.

Secondary vibrations can occur due to the propagation of acoustics in an air-borne manner, with the result manifesting as a secondary action, such as an audible rattle from a window pane.

8.3.2 Investigated Scenarios

Calculations in this section are based on a worst-case scenario and will not be relevant for all times of the development operations. It is based on peak hours (over a 1 hour equivalent period).

Information in this section made use of data supplied by the main consultant as well as discussions with train drivers at Golela train yard (c/o Terrence Petzer and Queen Nzabe).

8.3.2.1 Road traffic

It is likely that the road traffic volumes around the proposed rail loops will increase during the operational phase but this increase is unlikely to impact on the total noise levels. It will not be considered in scenario.

8.3.2.2 Railway traffic

Based on available information the initial operations were assessed taking into account the following:

- The railway lines were split into sections for various corrections. The daytime mainline operations of 4 x Class 43 electric locomotives and 160 x 4-axle tread braked wagons per train with 10 trains a day (5 delivery, 5 return) at 60 to 80 km/h. Trains can travel at 40 km/h in and around sensitive areas, this was not considered;
- The night-time mainline operations of 6 x Class 43 electric locomotives and 160 x 4-axle tread braked wagons per train with 6 trains per night (3 delivery, 3 return) travelling at 60 to 80 km/h;

- Ballast correction (acoustics attenuation due to ballast effect) was not considered on the single rail (main line);
- Intervening ground conditions of a medium ground nature, i.e. (50% hard ground conditions);
- Continuous welded rail (CWR) corrections were considered; and
- Assessment does not consider façade corrections or the row of houses acting as a screen when obstructing a direct line of sight to the railway line. Assessed calculations better illustrate potential noise levels at houses directly adjacent or with a direct line of sight to railway lines.

8.3.2.3 Rail infrastructure

A + 5 dBA correction can be implemented for train brake squeal at areas where momentum needs to be reduced or trains make periodic stops (reference as per SANS 10103:2008 methodology). The SANS 10103:2008 methodology indicates a + 5 dBA (tone, *C*t) in the calculation of the Rating level in the formulae $L_{Req,T} = L_{Aeq,T} + Ci + Ct$.

8.3.2.4 Existing ambient contributors and acoustical factors

- Receptors are regarded at a 2 meters height in relation to the surrounding environment.
- Intervening ground conditions of a medium ground nature, i.e. some flora etc. (50% hard ground conditions); and
- Activities functioning during wind-still conditions, in good sound propagation conditions (20°C and 80% humidity).

8.3.2.5 Investigated worst case scenarios – initial noise levels as modelled for peak hours:

This impact assessment is quite precautious and a worst-case scenario represents maximum equivalent (average) noise climate ($L_{Req,1\ h}$) the area could be exposed to during peak traffic hours. The potential initial day and night-time operational noise levels are presented in Appendix F1 and F2 of the specialist report.

Another method of indicating the potential noise climate is in a linear fashion. For the purposes of this illustration method, train speeds at 80 km/h are assessed in a linear fashion (no tone or impulse corrections). This result is illustrated in Figure 83**.** For reference purpose, a basic estimation of the existing ambient soundscape made use of 24.2 dBA (night-time) and 29.4 dBA (daytime) equivalent ambient soundscape with data taken from the lowest $\mathbf{L_{A90}}$ value/s measured at measurement points.

Figure 84 illustrates conceptual daytime worst-case peak operational contours of noise levels while Figure 85 illustrates a conceptual night-time scenario. Figures are based on a small portion of track for illustration purpose. Both day and night-times contours are illustrated from 35 dBA upwards (for better illustration purpose). Yellow to red contours illustrate the increase above the Equator Principle IFC of 45 and 55 dBA (night and day).These figures indicate a $L_{Req,1\ h}$ value with no tone corrections.

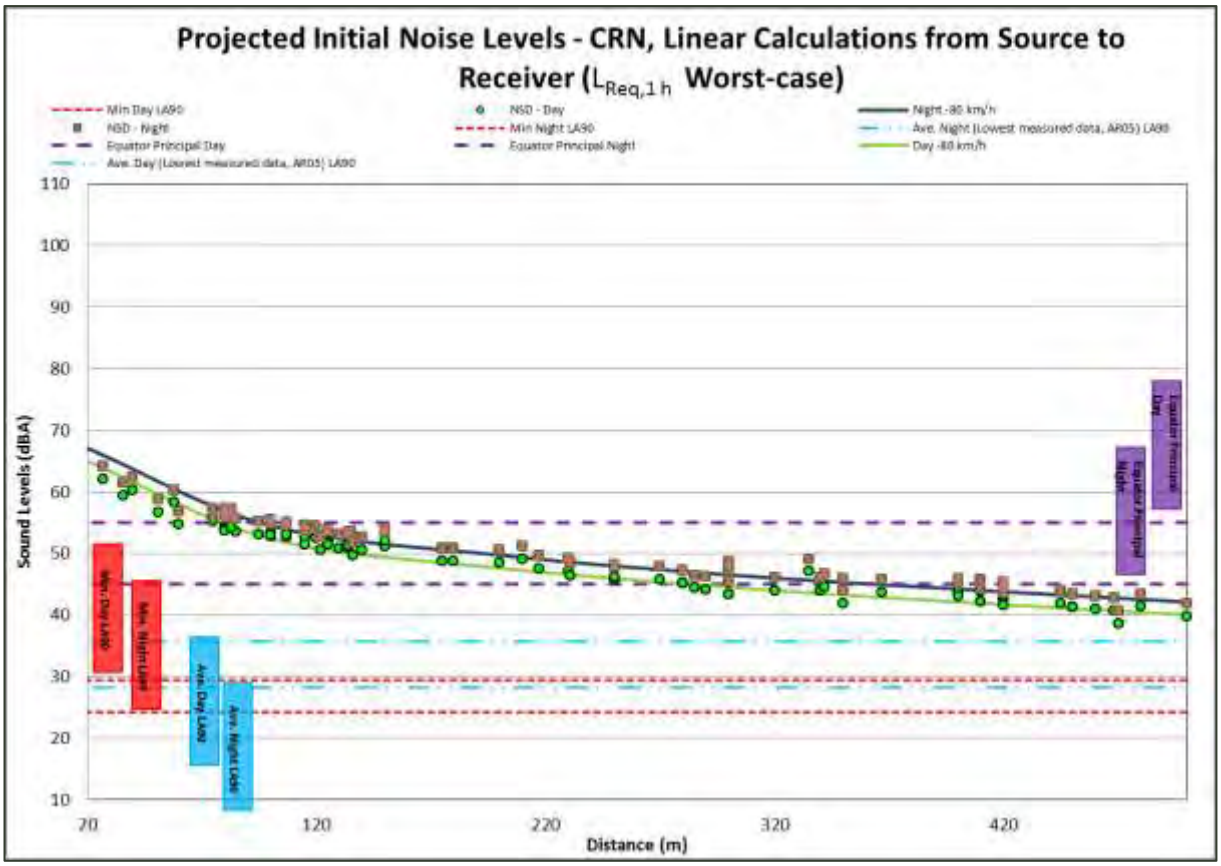

Figure 83: Basic linear calculations, noise climate vs. speed at distance from railway line

Figure 84: Projected initial scenario – Conceptual modelled worst-case daytime noise levels (no tone correction)

Figure 85: Projected initial scenario – Conceptual modelled worst-case night-time noise levels (no tone correction)

8.3.2.6 Investigated worst case scenarios – future noise levels as modelled for peak hours:

As with the initial noise levels modelled, this impact assessment is also quite precautious and a worst-case scenario represents maximum equivalent (average) noise climate ($L_{Req,1\ h}$) the area could be exposed to during peak traffic hours. The potential future day and night-time operational noise levels are presented in Appendix G1 and G2 of the specialist report.

Another method of indicating the potential noise climate is in a linear fashion. For the purposes of this illustration method, train speeds at 80 km/h are assessed in a linear fashion (no tone or impulse corrections). This result is illustrated in Figure 86**.** A basic estimation of the existing ambient soundscape made use of 24.2 dBA (night-time) and 29.4 dBA (daytime) equivalent ambient soundscape with data taken from the lowest $\mathbf{L_{A90}}$ value/s measured at measurement points.

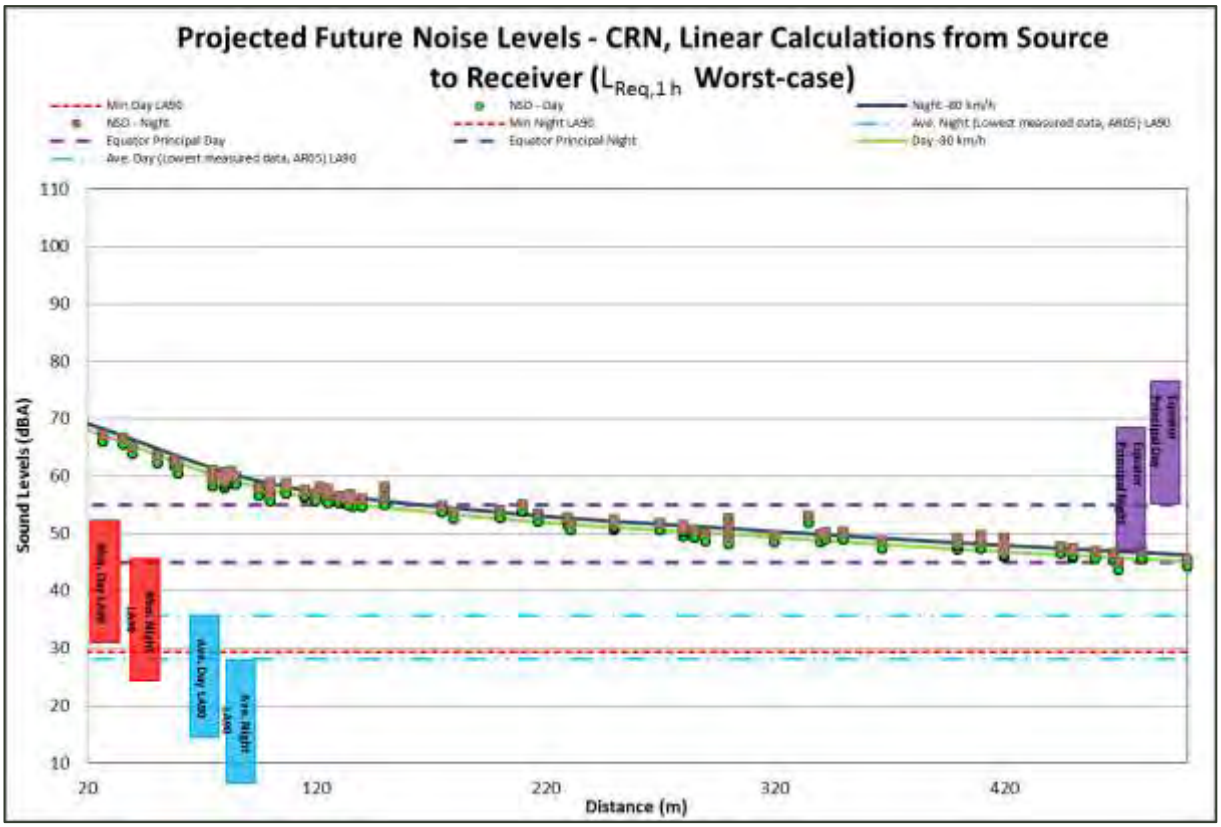

Figure 86: Basic linear calculations, noise climate vs. speed at distance from railway line

Figure 87 illustrates the conceptual daytime worst-case peak operational contours of noise levels while Figure 88 illustrates a conceptual night-time scenario. Figures are based on a small portion of track for illustration purpose. Both day and night-times contours are illustrated from 35 dBA upwards (for better illustration purpose). Yellow to red contours illustrate the increase above the Equator Principle IFC of 45 and 55 dBA (night and day).These figures indicate a $L_{Req,1\ h}$ value with no tone corrections. These figures indicate a $L_{Req,1\ h}$ value with no tone corrections.

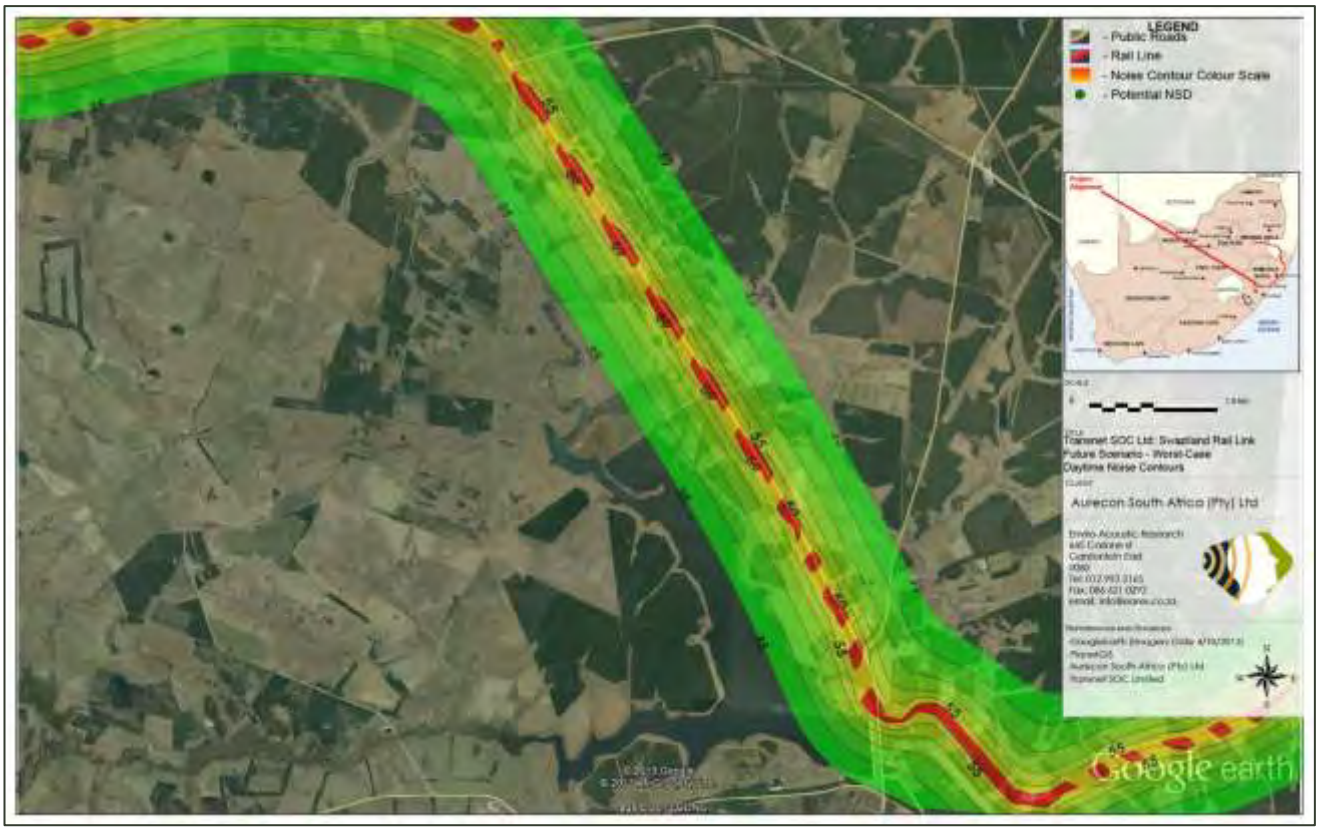

Figure 87: Projected future scenario – Conceptual modelled worst-case daytime noise levels (no tone correction)

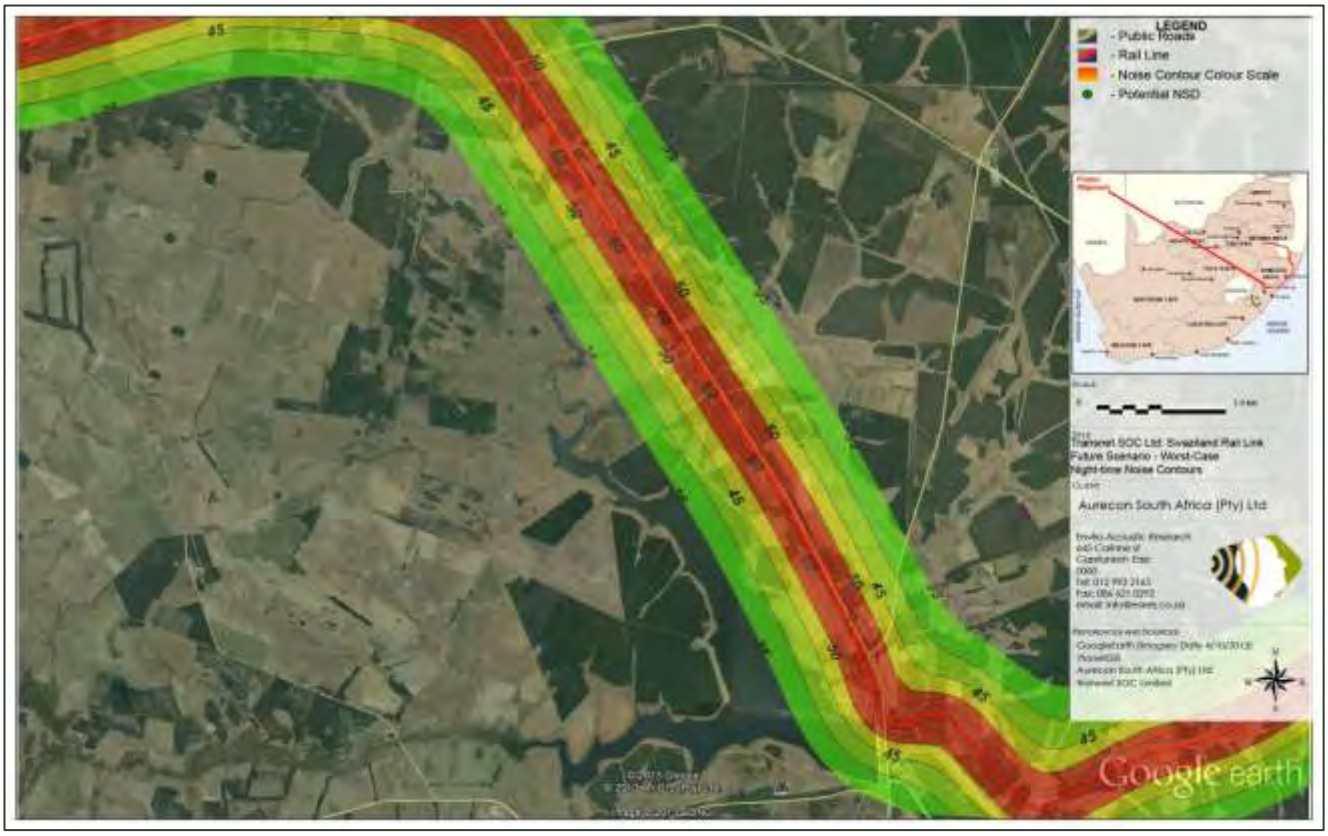

Figure 88: Projected future scenario – Conceptual modelled worst-case night-time noise levels (no tone correction)

The tables below describe the impact and sets out a summary of mitigation measures for the initial and future day and night time scenarios.

Table 58: Impact description of the initial day and night scenario

IMPACT DESCRIPTION: Initial day and night scenario				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Will continue after construction is complete	Consequence: Extremely detrimental	Significance: Very high - negative
Extent	Regional	Will affect surrounding communities		
Intensity	Very high - negative	Equivalent noise levels will exceed the Equator Principle during day and night-time hours		
Probability	Certain	The nature of the project will result in noise and vibration becoming a nuisance		
MITIGATION: • Programmes to manage rail and wheel roughness • Lowering of speed limits near sensitive areas • Screening of line of sight from sensitive receptors • Relocate receptors • Continuous public participation • Establishment of a help line and noise complaint logging • Environmental acoustical programme • Identifying of special receptors such as religious, health and educational facilities				
POST-MITIGATION				
Duration	Long-term	Will continue after construction is complete	Consequence: Highly detrimental	Significance: High - negative
Extent	Regional	Will affect surrounding communities		
Intensity	Moderate - negative	Equivalent noise levels will exceed the the Equator Principle during day and night-time hours		
Probability	Certain	The implementation of the proposed mitigation measures will reduce the potential negative impact and the potential positive economic impacts of the project might create a positive attititude towards the project		

Table 59: Impact description of the future day and night scenario

IMPACT DESCRIPTION: Future day and night scenario				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Will continue after construction is completed.	Consequence: Extremely detrimental	Significance: Very high - negative
Extent	Regional	Will affect surrounding communities		
Intensity	Very high - negative	Equivalent noise levels will exceed the the Equator Principle during day and night-time hours		

Probability	Certain	The nature of the project will result in noise and vibration becoming a nuisance		
MITIGATION: • Programmes to manage rail and wheel roughness • Lowering of speed limits near sensitive areas • Screening of line of sight from receptors • Relocate receptors • Continuous public participation • Establishment of a help line and noise complaint logging • Environmental acoustical programme • Identifying of special receptors such as religious, health and educational facilities				
POST-MITIGATION				
Duration	Long-term	Will continue after construction is completed.	Consequence: Highly detrimental	Significance: High - negative
Extent	Regional	Will affect surrounding communities		
Intensity	Moderate - negative	Equivalent noise levels will exceed the the Equator Principle during day and night-time hours		
Probability	Certain	The implementation of the proposed mitigation measures will reduce the potential negative impact and the potential positive economic impacts of the project might create a positive attititude towards the project		

Assessment indicated a potential sound environment where Equator Principle IFC guideline would be exceeded by the initial and future day and night-time operation sound levels during peak traffic periods at houses directly adjacent or bordering the train line. This is mostly due to the proximately of the proposed railway line in relation to certain receptors.

It must be noted that commercial railway line activities are exempted from certain requirements of Government Notice R154 of 1992 (Noise Control Regulations) – Regulation 2.(c) - *"Provided that the provisions of this paragraph* (in reference to noise emanating from a development) *shall not apply in respect of a disturbing noise or noise nuisance caused by rail vehicles or aircraft which are not used as recreational vehicles"*.

Furthermore the locomotive horns is exempted from the Government Notice R154 of 1992 (Noise Control Regulations) – Clause 7.(1) – *"the emission of sound is for the purposes of warning people of a dangerous situation".*

With a risk of a noise impact developing during the night-time hours of high significance, mitigation options as set out in the specialist report are recommended to be evaluated by the developer. As it is unsure of which (if any) mitigation options the developer may implement, identifying the potential impacts with mitigation options implemented cannot be assessed.

Mitigation Options: Management Mitigation

Public relations are important throughout the entire planning, construction and development of the project. The developer could consider the following:

1. *Public participation* – A developer representative could discuss the calculated noise levels in this document with receptors. The developer representative should indicate other positive aspects of the project (job and infrastructure enhancement in the area);

2. *Help line and noise complaint logging* - The developer could consider a line of communication (e.g. a help line where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers. Sporadic and legitimate noise complaints could develop. For example, sudden and sharp increases in sound levels could result from poorly maintained tracks. Noise complaints can be logged and supplied to railway maintenance staff to further investigate (rail roughness);
3. *Environmental Acoustical Measurement Programme* – The developer could implement a noise measurements programme and reporting conducted on an annual basis and preferably linked to a noise propagation model to illustrate the extent of the noise impact from the railway. This may enable the developer to identify and potential problems relating to noise from the development at that stage of the project operations; and
4. It must also be noted that it is unfair to expect the noises from the development to be inaudible under all circumstances (even mitigated noise) as this is an unrealistic expectation that is not required or expected from any other agricultural, commercial, industrial or transportation related noise source. Care must be taken to ensure that the sound produced by the proposed development is at a reasonable level in relation to the existing ambient sound levels.

8.3.3 Cultural and heritage resources assessment

Dr Johnny van Schalkwyk conducted the cultural and heritage assessment for the project. His specialist report can be found in Appendix B, Annexure H.

The NHRA stipulates the assessment criteria and grading of archaeological sites. The following categories are distinguished in Section 7 of the Act:

- **Grade I**: Heritage resources with qualities so exceptional that they are of special national significance;
- **Grade II**: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
- **Grade III**: Other heritage resources worthy of conservation on a local authority level.

The cultural landscape qualities of the larger region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial element (Stone Age and limited Iron Age) as well as a much later colonial (farmer/plantation) component. The second component is an urban landscape dating to the colonial period and is linked to the rural colonial landscape.

8.3.3.1 Statement of significance

The short (1880s to 1930s), yet intense period of railway development in South Africa saw the construction of a large number of bridging structures. Although the rivers and divides that had to be bridged are not as large as in Europe or North America, it never-the-less resulted in a number of hugely interesting and significant structures being developed (Van Schalkwyk 2013).

The existing railway line was constructed, from Durban northwards up to Mtubatuba by 1926 and completed up to Golela by 1927. Information regarding this development, the cost, number of bridges, stations and proposed route, was obtained from the 1924 Government Blue Book and is presented in Appendix 3 of the heritage specialist report.

In essence the total length of the line was to be 90 miles (88 miles for the route and 2 miles for side lines). The total budget was to be £ 350,412 and the construction was scheduled to last 1½ years. This also included the 9 bridges and culverts and the 18 stations and halts.

Analysis of the old topocadastral maps, dating respectively to 1942, 1966 and 1979, shows that the only roads that existed in the region until the late 1960s were gravel roads, in most cases following the railway line and this was eventually to become the R102. It was only during the early 1970s that the current N2 was constructed in northern KwaZulu-Natal (Floor 1985:43-44). Although the authoritative *Donaldson's South African Motor Routes (1924)* does not indicate a suitable road in the study region, a scrutiny of the different maps indicated that in other regions the roads also used to follow the railway lines. One result of this is that many of the road bridges are located in close proximity to the railway line, in some cases even close enough to share the same substructure (Figure 89).


Figure 89: Concrete road bridge near the railway line and an example where they share the same substructure

Based on current information regarding sites in the surrounding area, all sites expected to occur in the study region are judged to have **Grade III significance** and therefore would not prevent the proposed development for continuing after the implementation of the proposed mitigation measures and its acceptance by SAHRA. Table 60 provides a summary of the identified heritage resources.

Table 60: Summary of identified heritage resources

Category, according to the NHRA	Identification / Description
Formal protections (NHRA)	
National heritage site (Section 27)	None
Provincial heritage site (Section 27)	None
Provisional protection (Section 29)	None
Place listed in heritage register (Section 30)	None
General protections (NHRA)	
Structures older than 60 years (Section 34)	Yes
Archaeological site or material (Section 35)	Yes
Paleontological site or material (Section 35)	None
Graves or burial grounds (Section 36)	None
Public monuments or memorials (Section 37)	None
Other	
Any other heritage resources	None

8.3.3.2 Impact assessment

Impact analysis of cultural heritage resources under threat of the proposed development, are based on the present understanding of the development.

The following sites, objects and structures of cultural heritage significance were identified:

1. Stone tools dating from the Early and Middle Stone Age are known to occur sporadically in the study area. As these objects are open finds and not in their original position anymore they are classified as find-spots rather than sites. Such places and artefacts are viewed as having a low significance.

- All the known Stone Age find-spots in the study area are currently viewed to have low significance on a regional level and are classified as being of Grade III significance.
- No further action is required with regard to this issue.

2. A number of concrete arch and metal truss bridges across different rivers have been identified.
   - Dependant on the number of similar structures (according to function, age and architectural features) in the region, these features are viewed to have high significance on a regional level and are classified as being of Grade III significance.
   - In all probability these features are older than 60 years, although some of them might have been upgraded in the past. As they are inside the railway lines, the probability that it would be impacted on is very high. If that is to be the case, it should be documented (architectural drawings, descriptions and full photographic documentation) unless such information can be access from Transnet Heritage Foundation. After acceptance of this documentation by Amafa aKwaZulu-Natali/Heritage, application for a permit for its destruction can be applied for.

The table below describes the impact predicted by the heritage impact assessment, as well as the proposed mitigation measures.

Table 61: Impact description of the possible disturbance of cultural and heritage resources

IMPACT DESCRIPTION: Disturbance of cultural and heritage resources				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	The negative impact on heritage and cultural resources would have a permanent effect.	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Site-specific	Impact would be localised		
Intensity	High - negative	Should heritage and cultural resources be impacted on it could mean the removal and/or relocation of such resources.		
Probability	Very likely	Unclear if the buildings will be affected, it is however likely to happen although it is quite likely		
MITIGATION: Buildings, culverts and/or bridges older than 60 years to be demolished should be documented: • architectural drawings; • descriptions and full photographic documentation. After acceptance of these documents by SAHRA, application for a permit for its destruction can be applied for.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation, if it is required to demolish the buildings	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Site-specific	As per pre-mitigation		
Intensity	Moderate - negative	As per pre-mitigation		
Probability	Very likely	As per pre-mitigation		

8.4 Impacts on the Social and Socio-economic Environment

8.4.1 Social impact assessment

The social impact assessment (SIA) formed an important component of the EIA and was aimed at assessing and estimating, in advance, the social consequences that are likely to follow the implementation of the proposed project. The complete SIA assessment report can be found in Appendix B, Annexure E.

The SIA sought to provide a framework for prioritising, gathering, analysing, and incorporating social information and participation into the design and delivery of the project. Furthermore, the SIA ensured that the proposed project is informed and took into account the key relevant social issues.

The methodology took into account the distinction between social change processes and social impacts. A change process refers to a change that takes place within the receiving environment as a result of a direct or indirect intervention. An impact follows as a result of the change process. Impacts are those changes that are physically felt and emotionally experienced, positively and negatively. However, a change process can only result in an impact once it is experienced as such by individual persons, by groups of people and households, a community or society as a whole, social organisations and institutions individual/community on a physical and/or cognitive level.

The social impacts identified during the specialist assessments can be classified into the following broad categories:

8.4.1.1 Objective social impacts

These are impacts that can be quantified and verified by independent observers, such as changes in population size or composition, in employment patterns, in standard of living or in health and safety.

8.4.1.2 Subjective social impacts

These are impacts that occur “in the imagination” or emotions of people, such as negative public attitudes, psychological stress or reduced quality of life. This kind of impact is much more difficult to identify and describe, as one cannot readily quantify perceptions or emotions.

For the purpose of this SIA the following categories were investigated:

- Social well-being;
- Quality of the living environment;
- Economic impacts and material well-being;
- Family and community impacts;
- Institutional impacts, and
- Gender impacts.

The general criteria for selecting significant social impacts included the following:

- Probability of the event occurring;
- Number of people that will be affected;
- Duration of the impact;
- Value of benefits or costs to the impacted group;
- Extent to which identified social impacts are reversible or can be mitigated;
- Likelihood that an identified impact will lead to secondary or cumulative impacts; and
- Uncertainty over possible effects.

Positive impacts associated with the project include:

- The creation of temporary employment opportunities and social benefits;
- Opportunities for local sourcing of goods and services;
- Improved road infrastructure associated with development project;
- Local and regional economic benefits; and
- Increased development aid/investment from government and/or project investors.

Negative impacts that may be associated with this phase include:

- Social and cultural disruption and conflict due to population influx;
- Creation of spontaneous and informal settlements;
- Possible social pathologies arising from the population influx (such as crime, HIV?AIDS, prostitution etc);
- The need to secure accommodation for construction staff;
- Disturbance impacts related to physical intrusion (i.e. the impacts of dust, noise, traffic and pollution on sense of place, etc);
- Land use impacts and impacts on common property resources;
- Displacement; and
- Community perceptions and responses.

8.4.1.3 Impact assessment: Creation of temporary employment opportunities and social benefits

The results of the socio-economic survey indicate that the surrounding environment of the project are characterised by poverty and underdevelopment. Notable socio-economic statistics include:

- A *very high unemployment rate* – 31 percent of the surveyed population is unemployed;
- There is a significant *dependency ratio* in these areas, with 1 or 2 employed household members often having to provide for households with an average of 5.3 household members; and

From these figures, it is clear that the households in the project area face significant socio-economic challenges. The creation of employment opportunities can therefore be seen as a significant positive impact on the surrounding communities, even if these opportunities are only of a temporary nature.

During the household survey, the issue regarding creation of employment opportunities was most frequently mentioned in the area. There is a widespread high expectation Transnet should provide employment opportunities to the residents in the local area. With increased income-earning capacity the individuals and communities will be empowered.

Construction activities on the proposed railway project will create a number of permanent and temporary employment opportunities. The magnitude of this impact is related to the number of construction workers to be employed, either by Transnet itself or by contractors. It is recommended that local labour must be used as much as possible.

Sourcing of construction workers from the local labour pool is likely to be limited to unskilled and semi-skilled workers. This could have some economic benefits for surrounding communities, although only of a temporary nature. It is recommended that recruitment for new positions be undertaken through the *Employment Forum* that has been established by the local municipality.

In addition to creating job opportunities for construction workers, the project may also lead to *indirect employment creation* in the informal sector, for instance in terms of food stalls for the convenience of construction workers. Additionally, more informal employment opportunities may be created through a multiplier effect from the project's activities.

The table below describes the impact for the creation of employment opportunities as well as recommended mitigation (or maximisation) measures.

Table 62: Impact description for the creation of employment opportunities

IMPACT DESCRIPTION: Creation of employment opportunities				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Construction activities will create a number of temporary jobs	Consequence: Moderately beneficial	Significance: Low - positive
Extent	Local	Sourcing of construction workers from the local labour pool is likely to be limited to unskilled and semi-skilled workers		
Intensity	Moderate - positive	In addition to creating job opportunities for construction workers, the project may also lead to indirect employment creation in the informal sector		
Probability	Fairly likely	Semi-skilled and unskilled jobs will be created		
MITIGATION: Proactively manage: • Make use of local labour as far as possible. • Liaise with local community structures to identify local labour pool. • Provision of training or skills enhancements for local people (in advance of construction) to allow them to benefit from higher wages during construction and improve their potential for similar work in future.				
POST-MITIGATION				
Duration	Medium-term	As for pre-mitigation	Consequence: Moderately beneficial	Significance: High - positive
Extent	Local	As for pre-mitigation		
Intensity	High - positive	Increase in the number of locals employed will increase		
Probability	Certain	Semi-skilled and unskilled jobs will be created		

8.4.1.4 Impact assessment: Opportunities for local sourcing of goods and services

Local communities often have high expectations about participating in new opportunities in their area. *Local procurement* of goods and services are a manner that these communities can successfully partake in the development project. Local procurement can provide a fundamental linkage between the project implementers and the local communities.

Community contracting describes a number of different methods to implement infrastructure projects at a community level. These range from what is effectively direct implementation by project developers and contractors

using community labour, either on a voluntary or a paid basis, to structures where independent community-based organisations act as contractors on a similar basis to a private sector contractor.

Creating a platform where *Local suppliers development (LSD)* can take place would not only benefit the local micro, small and medium enterprises as they would be in a better position to win contracts, but the project implementer as well as they would have a bigger and more experienced pool of enterprises to choose from.

The table below describes the impact for the opportunities for local sourcing of goods and services as well as recommended mitigation (or maximisation) measures.

Table 63: Impact description for opportunities for local sourcing of goods and services

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: BEE opportunities</th></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><th>Dimension</th><th>Rating</th><th colspan="3">Motivation</th></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>Goods and services for the construction phase will be procured from compoanies owned by PDIs</td><td rowspan="3">Consequence: Moderately beneficial</td><td rowspan="4">Significance: Low - positive</td></tr>
<tr><td>Extent</td><td>Regional</td><td>Benefits will accrue to local entrepreuneurs and service providers</td></tr>
<tr><td>Intensity</td><td>Moderate - positive</td><td>Certain goods and services will still have to be acquired from outside the local ambit</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Transnet has set certain targets in terms of procurement progression, i.e. procurement from BEE companies</td></tr>
<tr><td colspan="5">MITIGATION:
Proactively manage:
• Include conditions in construction contract to involve and train emerging BEE Companies
• Local procurement opportunities
• Implement community contracting and training
• Create a platform where development of micro, small and medium enterprises is developed through LSD.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>As for pre-mitigation</td><td rowspan="3">Consequence: Moderately beneficial</td><td rowspan="4">Significance: High - positive</td></tr>
<tr><td>Extent</td><td>Regional</td><td>As for pre-mitigation</td></tr>
<tr><td>Intensity</td><td>High - positive</td><td>Increase in procurement from BEE companies</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">Local BEE companies will benefit</td></tr>
</table>

8.4.1.5 Impact assessment: Improved road infrastructure associated with development project

As mentioned earlier the needs analysis revealed that respondents felt that bad roads and associated transport problems has a negative impact on the quality of their life. Projects like construction of new railway lines cannot take place without creating access points and routes to the areas where the project is to take place, and this infrastructure can have countless positive consequences for the local communities. The current road infrastructure that has been classified by the local residents as bad will have to be upgraded, making it easier for the local communities to travel on and transport goods from and to places previously unreachable. Better road infrastructure and transport linkages can provide opportunities for catalysing local economic opportunities.

The table below describes the impact for the possible improvement of road infrastructure as well as recommended mitigation (or maximisation) measures.

Table 64: Impact description for the improvement of road infrastructure associated with the project

IMPACT DESCRIPTION: Improved road infrastructure				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Due to the nature of the project the impact on the land use and resources will be beyond the construction phase and will also be evident during the operational phase.	Consequence: Highly beneficial	Significance: Moderate - positive
Extent	Regional	The impact would be localised as a result of the nature of the impact		
Intensity	Moderate - positive	The development will have a reasonable negative impact on the land use as it could impact on access to land		
Probability	Fairly likely	Will most likely take place		
MITIGATION: Proactively manage: • Construction of road infrastructure • Upgrading current road infrastructure • Maintain newly constructed and upgraded road infrastructure				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation	Consequence: Highly beneficial	Significance: High - positive
Extent	Regional	As for pre-mitigation		
Intensity	High - positive	To accommodate construction vehicles the roads will be better maintained with increased benefits		
Probability	Very likely	As for pre-mitigation		

8.4.1.6 Impact assessment: Local and regional economic benefits

In addition to the economic benefits derived from employment, the development will also contribute to the local and regional economy in other ways. For instance, *local expenditure* by employees will have multiplier effects in various sectors of the economy, thereby stimulating business activity and further employment creation.

Changes in the local economy structure such as opening of new markets for products and services, increased demand for consumer goods and inflation of local prices can all have some positive outcomes on the local and regional economy for example profits that will be injected into the local and regional markets.

The project could also have *fiscal impacts* – in other words, an impact on government revenues and expenditures. In particular, payment of business and personal tax could contribute to government revenue at a national level, while rates and payment for services could strengthen the income base of the local municipality.

The table below describes the impact for the possible local and regional economic benefits as well as recommended mitigation (or maximisation) measures.

Table 65: Impact description for local and regional economic benefits

IMPACT DESCRIPTION: Local and regional economic benefits (operational phase)				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Creating employment will increase the spending regime in the area. Long term jobs will persist for the life span of the project	Consequence: Highly beneficial	Significance: High - positive
Extent	Regional	Will affect local and regional economies		
Intensity	Moderate - positive	Local expenditure by employees will have multiplier effects in various sectors of the economy, thereby stimulating business activity and further employment creation		
Probability	Certain	Increased employment levels will contribute to the economy		
MITIGATION: Not Applicable				
POST-MITIGATION				
Duration	Long-term	Economic benefits will persist for the duration of the project	Consequence: Highly beneficial	Significance: High - positive
Extent	Regional	The region will benefit from the implementation of the project		
Intensity	High - positive	Increased employment rate and available expenditure will contribute to the regional economy		
Probability	Very likely	As per pre-mitigation, albeit at an increase intensity		

8.4.1.7 Impact assessment: Increased support from government and/or project implementers

In many cases the project will be located in remote rural areas where the population is engaged in subsistence production that provide limited opportunities for development and economic growth. Low levels of skills and literacy can restrict communities in their ability to realise opportunities associated with the project.

Human Capital Development investments have both short and long term returns. In the short term, training and skills development can provide a basis for new augmented sources of income for the local population. In the long term, some projects may provide human development in the area through support for education, training and skills development.

The table below describes the impact for the possible increased support from government and/or project implementers as well as recommended mitigation (or maximisation) measures.

Table 66: Impact description for possible increased support from government and/or project implementers

IMPACT DESCRIPTION: Increased support				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Increased economic opportunities will lead to increased Government support	Consequence: Highly beneficial	Significance: Moderate - positive
Extent	Regional	Will have a regional impact		
Intensity	Moderate - positive	The increased economic activity in the area could result in positive response from local and regional governments		
Probability	Fairly likely	The increased government support isw fairly likely to happen		
MITIGATION: Proactively manage: • Capacity building and skills development				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation	Consequence: Highly beneficial	Significance: Moderate - positive
Extent	Regional	As for pre-mitigation		
Intensity	High - positive	As for pre-mitigation		
Probability	Fairly likely	As for pre-mitigation		

8.4.1.8 Impact assessment: Social and cultural disruption and conflict due to population influx

As news regarding the proposed project spreads, expectations regarding possible employment opportunities may also take root. Consequently, the area surrounding the site may experience an influx of job seekers.

The magnitude of this impact depends on the severity of unemployment in surrounding areas. It could be expected that migrant labours will flock to the area. Furthermore, poverty is a widespread problem in the South Africa, with an unemployment rate of more than 24% Given these figures, it is likely that a large enough number of job seekers will flock into the area to have a fairly significant population impact on the immediate social environment. This population increase may impact on the area in terms of additional demand for services and infrastructure.

An influx of newcomers seeking opportunities associated with the project could also create various *social problems.* Tension or conflict can be created as a result of religious or ethnic rivalries.

The table below describes the impact for the potential social and cultural disruption and conflict due to population influx as well as recommended mitigation (or maximisation) measures.

Table 67: Impact description social and cultural disruption and conflict due to population influx

IMPACT DESCRIPTION: Influx of job seekers				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Knowledge of the project will in all probability attrack unemployed people to the area during the construction phase	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Will affect local communities		
Intensity	Moderate - negative	A large number of job seekers could flock to the area to cause fairly significant impact on the social issues in the local arena		
Probability	Very likely	In view of the high unemployment levels in the area, this project will create expectations of job opportunities		
MITIGATION: Proactively manage: • As far as possible, make use of local labour. • Liaise with local community structures to identify mutually acceptable means of controlling the influx of job seekers or, if this is not possible, to mitigate the negative effects of such an influx. • Recruitment is to be conducted via the Employment Forum and not within the project area itself				
POST-MITIGATION				
Duration	Short-term	Through appropriate mitigation measures the impact will be restricted to the construction phase	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	As for pre-mitigation		
Intensity	Low - negative	The proposed mitigation measures will ensure the employment of more locals and thereby also reduce other social pathologies		
Probability	Fairly likely	Mitigation will incease the number of local people employed by the project		

8.4.1.9 Impact assessment: Creation of spontaneous and informal settlements

One of the contributors to the expansion of informal settlements is the influx of job seekers into the area, as these job seekers tend to settle in the informal settlements. However, many other factors are also responsible for the growth of informal settlements, which cannot all be attributed to the proposed railway line project. Therefore, this expansion in informal settlements is the result of many cumulative impacts, such as influences of other mines and factories in the area, current socio-economic conditions in the country and region and so forth.

Many impacts also arise from the expansion of informal settlements, especially an increase in associated social pathologies. The informal settlements are highly underdeveloped in terms of infrastructure. Most houses have no electricity supply, buy bottled water and have no refuse disposal systems. These informal settlers are also mostly unemployed as they are job seekers who migrate to the area.

In most instances the local communities would claim that the informal settlements are contributing directly to a number of problems. In particular, the community believes that these settlements lead to a higher crime rate in the area.

It is therefore clear that there is a cumulative impact of various preceding factors that influence the extent of this impact. It is possible that an influx of job-seekers moving into the area because of the project will cause informal settlements to expand even more, and thereby exacerbate the social problems mentioned above.

Measures to mitigate or control the expansion of informal settlements will have to be implemented with considerable sensitivity so as not to infringe on people's constitutionally guaranteed right to freedom of movement. To this end, it is recommended that and Transnet facilitate the establishment of a "Community Safety Committee" with the aim of monitoring and controlling illegal squatting. The suggested membership of such a committee would include:

- The Community Relations Department of Transnet;
- Respective Local Municipalities;
- Local landowners;
- Representatives of local community; and
- Local police and the Community Policing Forum.

The functions of this committee would include:

- Frequent monitoring of the area to detect the establishment of new informal settlements. (It is foreseen that this function could be carried out by Community Relations Department of Transnet in cooperation with the local Community Policing Forum, as well as other stakeholders in the area);
- The establishment of a "hotline" at a local police station or at the local municipality for reporting of illegal squatting. The number of this hotline should be widely disseminated among local communities and landowners to ensure that the erection of new informal settlements is reported as soon as possible, thereby allowing for timeous response ; and
- The formulation, in consultation with all relevant stakeholders, of an appropriate plan for responding to illegal squatting.

The table below describes the impact which could arise due to the creation of spontaneous and informal settlements as well as recommended mitigation (or maximisation) measures.

Table 68: Impact description for the creation of spontaneous and informal settlements

IMPACT DESCRIPTION: Creation of informal settlements				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Shortage of housing might lead to the establishment of informal settlements during the construction phase	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Will affect local communities		

Intensity	Low - negative	The establishment of informal settlements will have a negative impact on social aspects in the area		
Probability	Fairly likely	In a region with high levels of unemployment this is very likely to happen when job seekers flock to the area of the project		
MITIGATION: Proactively manage: • Facilitate the establishment of a "Community Safety Committee" to monitor and control illegal squatting. Committee to consist of: - The Community Relations Department of Transnet - Its counterparts at other mines in the area - The Local Municipality - Local landowners - Representatives of the local community - Local police and the Community Policing Forum • Align social investment strategies with municipal development • Transnet employees who receive living-out allowances should be required to provide proof that this allowance is used for formal accommodation. • Include a requirement in the Conditions of Service of construction contractors that construction workers must be vacated from the area once construction is complete.				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	As for pre-mitigation		
Intensity	Low - negative	Mitigation will reduce the need for non-local people to travel to the area		
Probability	Fairly likely	Reduced need for non-locals to move to the area in search of jobs will reduce the likelihood of establishment of informal settlements		

8.4.1.10 Impact assessment: Possible social pathologies arising from population influx

It is assumed that the biggest percentage of the construction workforce for the Swaziland Railway Link will be locals, while the remainder will have to be housed reasonably close to the construction site. It is possible that *conflict* might arise between the newcomers and local residents. One possible reason for such conflict would be the perception among locals that the outsiders are taking up jobs that could have gone to unemployed members of the local community. An influx of unemployed job seekers (which was discussed in the preceding sections) could add to the potential for conflict.

One of the potential social pathologies that may arise from a rapid increase in population numbers in an existing underdeveloped area is an increase in *crime levels*. The extra strain that the influx of job seekers will place on limited employment opportunities in the area will potentially increase the unemployment rate, which will increase the crime rate. Even if particular instances of crime are not as a result of the newcomers, they may still be attributed to them by local communities.

Another possibility is that a population influx will contribute to *alcoholism*, *drug abuse*, *prostitution* and the spread of *sexually transmitted diseases* in the local population. An influx of newcomers can overburden the health services and infrastructure, inadequate sewage and waste management and can increase some health risks

The table below describes the impact which could arise due to possible social pathologies due to population influx as well as recommended mitigation (or maximisation) measures.

Table 69: Impact description for possible social pathologies arising from population influx

IMPACT DESCRIPTION: Social pathologies arising from population influx				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Influx of job seekers during the construction phase could lead to conflict between locals and newcomers	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Will affect local communities		
Intensity	Moderate - negative	• An influx of unemployed job seekers could add to the potential for conflict. • An influx of construction workers and job seekers might be accompanied by an increase in crime. • Another possibility is that a population influx will contribute to alcoholism, drug abuse, prostitution and the spread of sexually transmitted diseases in the local population		
Probability	Very likely	Even if particular instances of crime are not as a result of the newcomers, they may still be attributed to them by local communities		
MITIGATION: • Additional security must be provided during this period by the contractors, which should be integrated with existing community systems. • Implement HIV/AIDS awareness programs, improved quality of water supply and alcohol abuse campaigns in the communities. • Align awareness campaigns with those of other organisations in the area.				
POST-MITIGATION				
Duration	Short-term	The potential impact will be management during the construction phase	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Low - negative	Management of the social interaction between locals and newcomers will reduce the potential impact		
Probability	Fairly likely	By appropriate management of the issue the potential intensity for the development of such pathologies will be reduced.		

8.4.1.11 Impact assessment: The need to secure accommodation for construction staff

It may be necessary to find accommodation for a number of construction workers in the vicinity of the proposed developments. One option would be to house them in a construction village. The other option will be to house them in nearby settlements. This may require that the local Municipality or Transnet invest in the construction of additional housing units.

A major concern for communities in the area relates to the management of housing for the construction workers who are employed by the contractors. Construction contractors also reportedly do not construct adequate housing facilities for their workers, resulting in the expansion of informal settlements and other social pathologies, such as increased crime levels.

The construction of additional housing units for construction workers will increase the pressure on the service infrastructure. In addition, there is an existing perception among community members that construction workers from contractors move into the area and stay there even after construction activities have completed. The construction of additional housing units for construction workers might reinforce this perception and cause resentment.

Therefore, it is recommended that a construction village be used as housing for the construction workers. It is recommended that one construction village be used to house construction workers of the project components to minimise the extent of pressure the additional housing will exert on social and municipal infrastructure. Since the construction timeline of the proposed project components is sequential with some overlapping time periods, it is necessary to ensure that the construction village is large enough to accommodate the maximum number of construction workers that will be employed at any given time.

Furthermore, it would be preferable if sufficient entertainment facilities could be included in the construction camp. Entertainment facilities could comprise a lounge with pool table, television, vending machines for soft drinks, etc. By providing entertainment facilities, the workers' motivational levels may increase and the risk to social pathologies will decrease. If entertainment facilities cannot be included in the camp layout, attendance of alternative entertainment facilities must be encouraged.

Once construction of the project components is completed, the construction camp should be demolished completely to avoid settling of informal residents. As an alternative, the construction contractor may negotiate with the local municipality about possibly selling or donating the construction camp to them for use as formal housing in the area.

The table below describes the impact which could arise due to the need to accommodate construction staff as well as recommended mitigation (or maximisation) measures.

Table 70: Impact description for the accommodation of construction staff

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Accommodation for construction staff</th></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><td>Dimension</td><td>Rating</td><td colspan="3">Motivation</td></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>Influx of job seekers during the construction phase could lead to the need for additional accommodation</td><td rowspan="3">Consequence: Negligible</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Site-specific</td><td>Impact will be restricted to sites where additional accommodation is required</td></tr>
<tr><td>Intensity</td><td>Low - negative</td><td>Additional accommodation will have an impact on resources and possible conflict with locals</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">Local communities frequently, rightly or wrongly, associate newcomers with social problems</td></tr>
<tr><td colspan="5">MITIGATION:</td></tr>
</table>

• Housing of construction workers in a construction village. • Maximisation of the proportion of job opportunities allocated to locals thus reducing the need for outsiders. • Provision of sufficient entertainment facilities (eg lounge with TV, pool table etc) • Demolishing construction village after construction activities have finished, or donating the construction camp to the local municipality for formal housing, or alternatively convert the construction camp to permanent housing for labourers during the operational phase.				
POST-MITIGATION				
Duration	Short-term	Management of the issue could contain the impact to construction phase	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As per pre-mitigation		
Intensity	Very low	Mitigation will alleviate the pressure on local housing		
Probability	Certain	Even with mitigation potential still exists, albeit at a lower intensity		

8.4.1.12 Impact assessment: Disturbance impacts related to physical intrusion

Impacts related to noise, visual aspects, air quality and the like are discussed under this heading, as all these impacts are related to the physical presence of project-related infrastructure and the intrusion this imposes on surrounding communities. Such intrusion could impinge on the lives of surrounding communities by affecting the area's sense of place.

Several factors have to be borne in mind when assessing the potential magnitude of such an impact. One of these factors is the current state of the landscape in which the development is situated. The landscape already bears the marks of development and as such sense of place will not be such a major issue.

Another factor to take into account when assessing the impact on sense of place is the meanings that people who live or work in an area attach to the anticipated changes. If a development promises to offer tangible benefits to surrounding communities (in terms of job creation, etc.), it is unlikely that its impact on the character of the landscape will be perceived in a negative light – even if that impact is substantial from an aesthetic point of view.

Dust generated by construction activities, and by vehicles moving on access roads during construction could affect air quality in the area. The air quality specialist study reports on the potential impacts on air quality in the area. Construction activities may also increase noise pollution in the area.

As indicated above, the impact of a development on the character of the landscape may not be experienced as negative if that development offers tangible benefits. To the extent that the project benefits local communities, it is therefore unlikely that they will experience it as a significant negative impact on the area's sense of place.

The table below describes the impact due to the physical intrusion as well as recommended mitigation (or maximisation) measures.

Table 71: Impact description for physical intrusion

IMPACT DESCRIPTION: Physical intrusion				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				

Duration	Long-term	The construction activities will impact on the sense-of-place	Consequence: Moderately detrimental	Significance: High - negative
Extent	Local	Local communities will be affected		
Intensity	Moderate - negative	Impacts related to noise, visual aspects, air quality and the like are related to the physical presence of project-related infrastructure and the intrusion this imposes on surrounding communities by affecting the area's sense of place.		
Probability	Certain	Due to the nature of the project these impacts will be generated and affect the communities		
MITIGATION: • See separate specialists reports for noise impacts, visual impacts and air quality for mitigation measures. • Do not engage in construction activities during church church gatherings or at night. • Liaise with local communities as to the activities scheduled and avoid construction during these times, if possible.				
POST-MITIGATION				
Duration	Long-term	Will be mainly limited to the construction pahse	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Impact will be contained at local level		
Intensity	Low - negative	Mitigation will lower the crime levels		
Probability	Very likely	Due to the nature of the project these impacts will be generated and affect the communities, albeit a lower level of intensity		

The mitigation measure highlighted in red as proposed by the specialist and contained in the specialist report was found to be unfeasible to implement at all times during the construction phase. This is due to the very tight timelines set to complete the construction activities in order to ensure the railway line is commissioned on time. It is the EAPs opinion that, with the full implementation of the EMP, sufficient mitigation exists to prevent unprecedented disturbance of the public. **This mitigation measure will thus not be considered**. Even without the mitigation referred to above, the significance rating therefore remains as is, in other words Moderate - Negative.

8.4.1.13 Impact assessment: Land use impacts and impacts on common property resources

There is a probability that the project will result in impacts on traditional land rights, occupations and production systems, it can as well result in increased and unsustainable utilisation of local natural resources. There may be a loss or reduction in existing land use, potential land use, access to or quality of natural resources on which communities depend now or in the future.

In the above sections we saw that 9% of households' main source of water is the river, with a linear project like this it is bound to happen that some of the households will lose access to their primary water source. Furthermore it was indicated that 43% of households has land under cultivation and when rural subsistence farmers are cut off from their livelihood it poses a big and complicated problem. Special investigations should be done to identify affected land owners, create access points and compensate affected parties appropriately.

Access to common property resources are at risk with a linear project like this, access to water, grazing, hunting and fishing areas, timber and fuel wood, medicinal and herbal plants, craft materials and seasonal uses are all at

threat. It is not just access to and availability of these communal resources that are threatened but the construction phase poses an imminent risk to the quality of these resources especially water resources.

The table below describes the impact on land use and common property resources as well as recommended mitigation (or maximisation) measures.

Table 72: Impact description for land use impacts and impacts on common property resources

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Land use impacts and impacts on common property resources</th></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><td>Dimension</td><td>Rating</td><td colspan="3">Motivation</td></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Long-term</td><td>Due to the nature of the project the impact on the land use and resources will be beyond the construction phase and will also be evident during the operational phase</td><td rowspan="3">Consequence: Moderately detrimental</td><td rowspan="4">Significance: Moderate - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>The impact would be localised as a result of the nature of the impact</td></tr>
<tr><td>Intensity</td><td>Moderate - negative</td><td>The development will have a reasonable negative impact on the land use as it could impact on access to land</td></tr>
<tr><td>Probability</td><td>Very likely</td><td colspan="2">Will most likely take place</td></tr>
<tr><td colspan="5">MITIGATION:
• See that the consumption of natural resources in construction phase is minimised.
• Construct enough access points.
• Appropriately compensate affected landowners.
• Put necessary measures in place to minimise or eliminate any pollution by project.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Long-term</td><td>As for pre-mitigation</td><td rowspan="3">Consequence: Moderately detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>As for pre-mitigation</td></tr>
<tr><td>Intensity</td><td>Low - negative</td><td>Mitigation measures will alleviate the impacts on landowners and resource utilisation</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">As for pre-mitigation</td></tr>
</table>

8.4.1.14 Impact assessment: Displacement

Historically development induced displacement in South Africa has been negatively perceived by the population as previous projects relocated project affected persons without proper consultation and compensation. This left the people affected scared and others wary of development projects and the consequences they have. There should be proper mechanisms for addressing the relocated person's grievances to restore their livelihoods and prevent them from feeling helpless or powerless.

There will be a permanent loss of life-long social and emotional investment as well as livelihood resources for the households that need to be relocated. Special care should be taken to relocate the affected households back into their own communities through using the infill method.

In Figure 90 below the potential households that will have to be relocated in KwaMasane are shown. The coordinates for the above mentioned community is; 28°26'20.39"S 32° 9'24.96"E. The red line indicates the new rail alignment and the blue line indicates the current rail alignment. At this stage the relocation buffer zone has not yet been specified and agreed upon, for that reason the figure below only represents the potentially directly affected households.

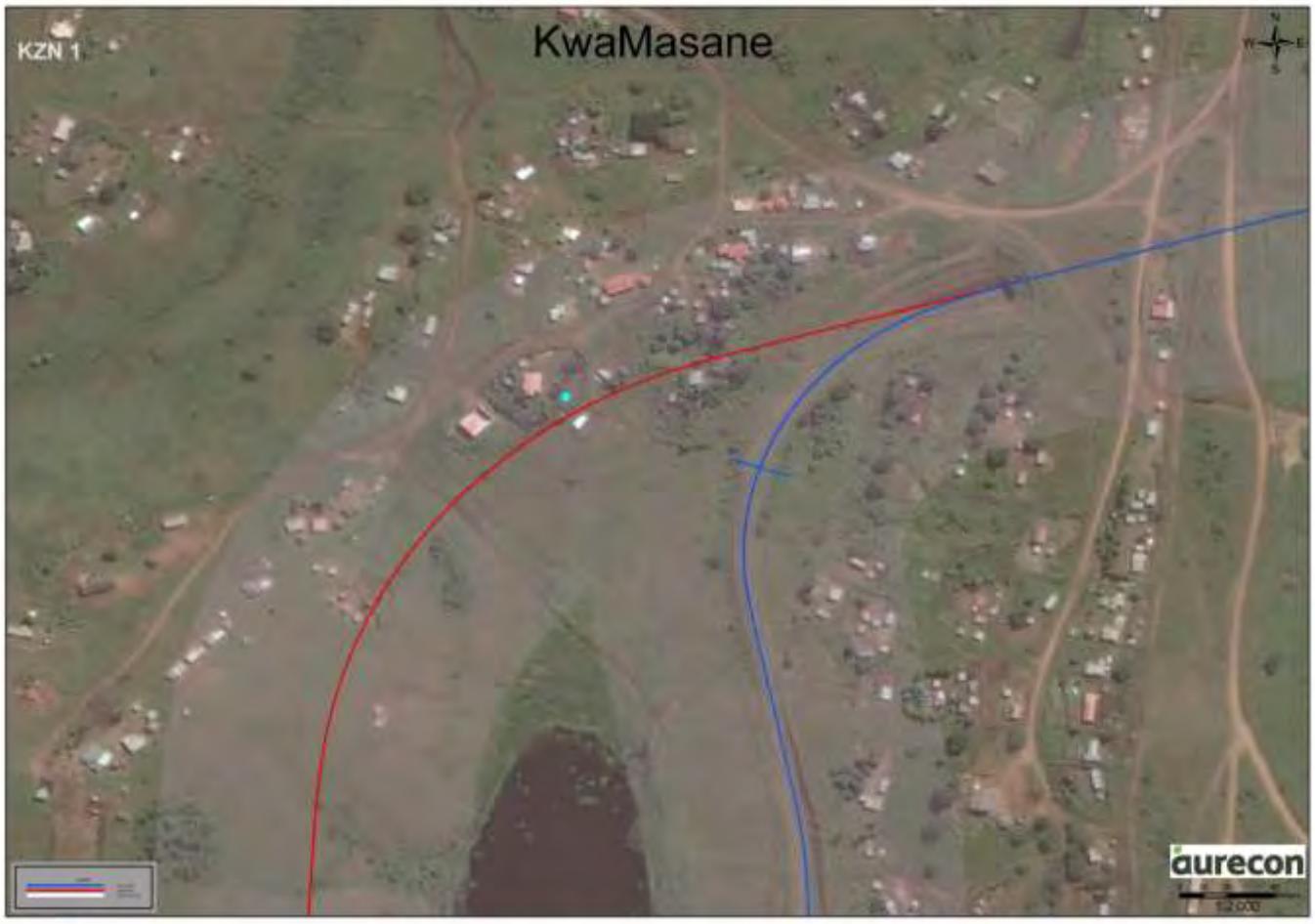

Figure 90: KwaMasane directly affected households

Figure 91 and Figure 92 below show the potentially directly affected households in Mtubatuba area that will either need to be relocated or compensated. The coordinates for the two locations are Figure 38; 28°25'23.87"S 32°10'41.27"E, and Figure 39; 28°24'47.50"S 32°10'48.88"E, further investigations will need to be done to identify all the directly affected parties in the Mtubatuba area.

Figure 91: Mtubatuba directly affected households

Figure 92: Mtubatuba directly affected households continue

As seen in Figure 93 there are households in the Mfekayi area that will be directly affected and be potentially relocated. The coordinates for this area is 28°12'6.84"S 32°17'55.54"E.

Figure 93: Mfekayi directly affected households

Figure 94, Figure 95 and Figure 96 are representative of the potential households that will be directly affected in the Qakwini community area. The coordinates for these areas are Figure 41; 28° 9'47.32"S 32°18'30.42"E, Figure 42; 28° 9'35.58"S 32°18'32.35"E and Figure 43; 28° 9'21.93"S 32°18'35.10"E.

Figure 94: Qakwini directly affected households

Figure 95: Qakwini directly affected households continue

Figure 96: Qakwini directly affected households continue

The table below describes the impact due to the possible displacement of people as well as recommended mitigation (or maximisation) measures.

Table 73: Impact description for displacement

IMPACT DESCRIPTION: Displacement				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Relocation of affected households will have a long term impact	Consequence: Highly detrimental	Significance: High - negative
Extent	Local	The impact will be restricted to the affected households and will therefore be contained at local level		
Intensity	High - negative	Relocation of affected households will have a profound impact on the affected households		

Probability	Certain	The project potentially affects a number of households in KwaMasane, Mtubathuba, Qakwini and Mfekayi		
MITIGATION: • Adequate compensation. • Proper grievances measures • Suitable Relocation Action Plan				
POST-MITIGATION				
Duration	Long-term	As per pre-mitiagtion	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	As per pre-mitiagtion		
Intensity	Low - negative	Implementation of appropriate mitigation measures will allevaite the potential impacts		
Probability	Fairly likely	The implementation of the mitigation measures will not prevent the relocation of households but will assist in alleviating the negative association of relocation		

8.4.1.15 Impact assessment: Community perceptions and responses

The communities in the area generally have no major problems with the proposed railway line, as they expect it will create employment opportunities in the area. However, significant concerns have also been raised about the possible negative impacts of the project. In particular, influx of construction workers and job seekers and concomitant social effects associated with the two. The as seen above some of the farm owners were consulted and they were given the opportunity to voice their issues and concerns. Here are some of the issues and concerns:

Mr W. Davidson and Mr D. Davidson

Mr Davidson farms with macadamia nuts and eucalyptus trees, he also has litchi, guava, lemon/ lime, mango, orange and papaya/ pawpaw trees. He has 310 goats on his farm as well. His farm has been passed down by generations and he personally has lived on the farm for 77 years. He permanently employs 49 people and has a big number of tenants living on his farm. He has raised the following issues:

- A water pipe crosses the proposed railway alignment (farmer wants to keep the use of it)
- A power supply cable crosses the proposed railway alignment
- Buried optical fibre line is situated underneath the level crossing
- He wants more than one railway crossing
- Mr Davidson wants to know who are the design engineers and be contacted by them
- They want to know which side of the current rail will the proposed railway line be built
- The farmers concerned about the fires caused by the trains, especially when the brakes bind or bearings seize. They are also concerned about the maintenance and lack of maintenance done currently and in the future
- Previously when Transnet replaced railway sleepers the sleepers were left next to the rail, farmers concerned about the pollution and littering of old and unused materials
- There is a school on the other side of the railway that will be cut off from the road with construction, this could cause a serious accident zone
- The farmers would like some socio-economic benefits for their area, for example if the train could pick up and transport local produce/ freight/ passengers
- Wants to know what will be happening at Mapoza station which is currently not in use.

Mr Peter and Mr Edgar Freese

Mr Peter Freese has had his farm for 22 years already. He has a small amount of fruit trees around the homestead and farms with cattle; he also has some chickens and ducks/ geese around the home. He employs 8 permanent

and 5 temporary staff. Mr Edgar Freese has had his farm for 25 years and utilises the farm as a game farm with 200 different game species on it. He has raised the following issues:

- Where the line deviates from the current line there will be 'wasted space' see Figure 97, that the farmers will not be able to use as they will not have access to it. Will Transnet buy that piece of land from them or give them access ways?

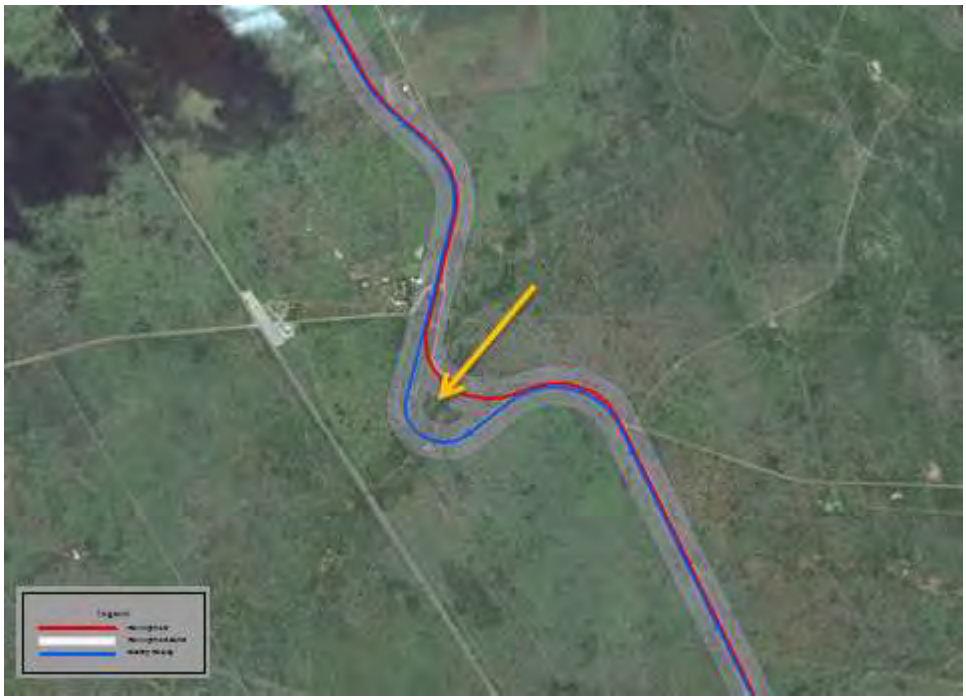

Figure 97: Evelyn RE 17117 – Peter Freese

- RE/15607 will be cut in 4 pieces and this makes it economically unviable. Farmer not happy with this at all he wants to know what Transnet will do to mitigate this problem.
- They are livestock farmers and want to know if there will be enough crossings to move their livestock.
- They want sufficient access to all parts of their farm.
- Farmers wants Transnet to maintain and police the fences they put up as a lot of their livestock gets killed and stolen. If Transnet does not do this they must pay the farmers for any damages or losses.
- Edgar Freese is willing and in favour of the line if Transnet buys portion of land from him.
- The new alignment will go through his existing dam, borehole, windmill and reservoir and this will not only cut him off from his main water source but eliminate his water source sufficient. The farmer is of the view that some compensation and replacement must be given and that the design engineers and Transnet Land Acquisition team must contact Mr Pete and Edgar Freese

<u>Mr Van Eeden</u>

Have been living on the farm for 24 years and has a forestry and transport business on the property. They also farm with cattle, ostriches and horses. They have some tenant on the property and employ 15 permanent employees. Mr van Eeden raised the following concerns:

- Concerned about the noise and vibration as the proposed line will be 50m from the main house see Figure 98.
- They concede that the design engineers must look at options to move the line a little to the right as indicated by the red arrow in Figure 98.

- Proposed line will be in between their tennis court and the main house (approximately 20m from the main house) this is a big concern for the Van Eeden family and Transnet is requested to please look at alternative routing for the railway line, as well as sufficient compensation and replacement has been requested and will have to be agreed upon if the route can't be moved, see Figure 99.
- Proposed line will go through and split the ostrich and cattle camp see Figure 100, fences will need to be maintained and access granted so that the farmer can get to and move livestock
- Farmer worried that the portion of land will lose value.

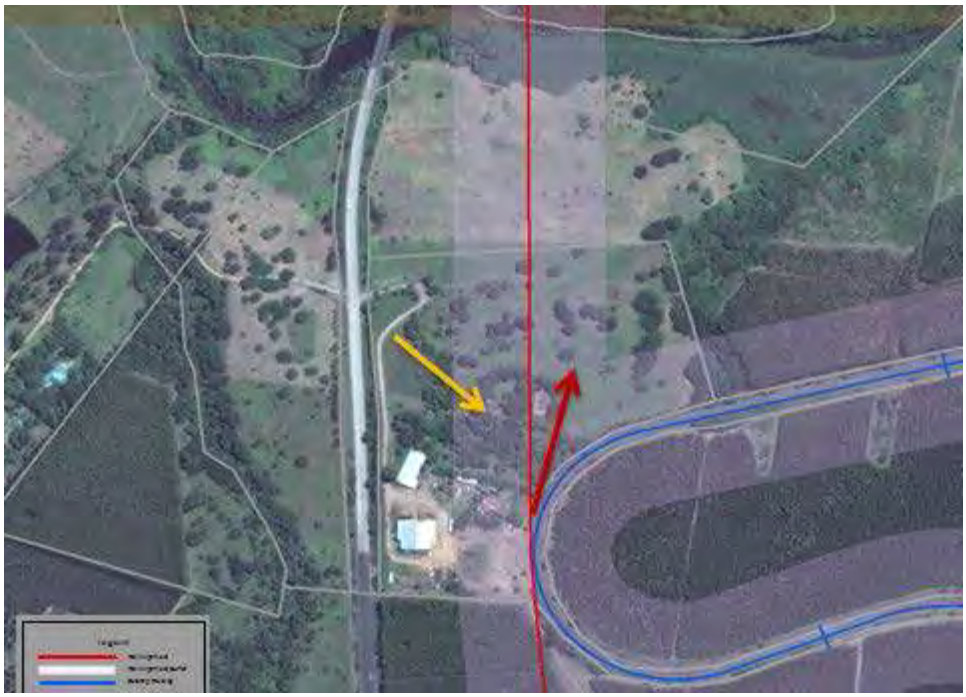

Figure 98: Portion 8, Mcilrath 14452GV - Van Eeden

Figure 99: Van Eeden tennis court

Figure 100: Cattle and ostrich camp

Mr Barry Bird

Mr Bird has bought this farm 9 years ago and moved there from Richards Bay. His daughter runs a lodge from the property and his son has a ‘handyman’ business which he also runs from the farm. They moved here because of the peace and quiet and to be closer to nature.

- His portion is only 23ha, and he is of the view that if proposed line is constructed on his side of the line it is a big problem for him as he will lose a lot of land.
- Noise and vibration is a big concern to him as his house is only a couple of hundred metres away from the railway line see Figure 42 , he also has a lodge (Boshoek Lodge) on his property and more noise and vibration will have a negative effect on his business.
- The current trains brake and accelerate on his portion and it causes loud noises, he is worried that with the new rail and bigger and heavier trains that the noise will be unbearable.

Figure 101: Portion 7 Umbukwane - Barry Bird

Mr Grewar van Huyssteen – Sappi

- If proposed line falls into current servitude they do not have a problem, but if it falls outside they will lose land or access to land, then they will have concerns with the construction of the railway line
- They are concerned about losing access to their land or that access points will not be big enough for their trucks to pass through
- They requested that all current access points be retained
- They want to know the exact location of proposed line

Mr Murray Wilson Brown – Kwambo Conservancy

- They have ecological concerns and want to be kept informed.

Mr Malcolm Thompson - Karel Landman Trust t/a Pongola Game Reserve

- The proposed double railway line will have impacts on the Trans frontier Park initiative.
- Concern about the increased mortalities that will be caused by the double line, as putting up fences will not work in the reserve.
- The reserve is a TOP registered game reserve.
- See park management plan attached Appendix 3.

- The line increases the threat to the Black Rhino project.
- Worried about what impact the noise will have on their guests.
- The railway line is regarded as having a negative visual impact.
- At the moment the reserve and Transnet have good understanding regarding the speed limit in the reserve and driver conduct, when a driver hits an animal they should contact the reserve immediately. The reserve wishes to keep this good communication and understanding between them and Transnet, but they would like a Code of Conduct for the drivers passing through the game reserve to be put in place, and also to formalise the speed limit within the game reserve.
- The reserve is the main income source for the Landman family and therefore it is very important for them to keep their credibility, so that they can uphold their economic status.
- The conduct of the construction and maintenance crews are very important to the reserve as this is a sensitive area and it needs to be handled in a balanced and correct manner. They would also like a Code of Conduct for the maintenance crews to be put in place, regarding access protocols and how they conduct themselves during maintenance projects.
- The two main impacts the reserve is concerned about are; animal mortality and impact on ecotourism (noise, vibration and visual).
- The reserve wants to know if Transnet is widening the railway reserve and/ or are they looking for new reserve as some parts of the rail reserve are very narrow and would not be big enough for a second track.
- The reserve enquired where exactly the rail will be constructed, without exact location they could not comment comprehensively – design engineers need to contact the Pongola Reserve for further discussion;
- The reserve has concerns about their access to the lodges and requested that during construction access must not be blocked as this will seriously influence the their business and livelihood.
- The reserve is also concerned about feedback from Transnet and requested that an effort is made by Transnet to answer any questions that the reserve may have.
- The reserve permanently employs 87 skilled workers and spends about R 4 million on salaries annually
- They use electricity and solar energy for lighting, cooking and heating and has 3 boreholes and a well for domestic and game use.
- Two black rhinos, 3 elephants, kudus etc. have already been killed on the railway line.
- The reserve requested that the servitude needs to be as small as possible and that only selective clearing takes place (do not remove large trees and bushes), that Transnet be responsible for this clearing in terms of an agreement on the scale of the clearing, and that Transnet be responsible for maintaining the access road along the railway line.
- The reserve requested that there must be a formal management plan and agreement between them and Transnet.

While the potential impacts related to these effects were discussed earlier, they are mentioned here due to the fact that community perceptions and concerns regarding these effects may in themselves constitute a significant social impact. If community members believe that the project will have a negative effect on their lives – regardless of whether or not this perception is justified – they are likely to be extremely resistant to the proposed developments. This constitutes a source of social risk to the project, which should be addressed by allaying unjustified community fears regarding the project, and instituting appropriate mitigation measures to address realistic concerns.

The table below describes the impact on community perceptions and responses as well as recommended mitigation (or maximisation) measures.

Table 74: Impact description relating to community perceptions and responses

IMPACT DESCRIPTION: Community perceptions and responses				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Negative perceptions of the impacts of the project by the local communities will develop prior to and during the construction phase	Consequence: Slightly detrimental	Significance: Moderate - negative
Extent	Local	Localised impact		
Intensity	Moderate - negative	• Generally no major problems with the proposed upgrade, as communities expect it will create employment opportunities in the area • Concerns have been raised about the possible negative impacts of the project, in particular, influx of construction workers and job seekers and concomitant social effects, including air quality due to dust during construction		
Probability	Certain	If community members and farmers believe that the project will have a negative effect on their lives – regardless of whether or not this perception is justified – they are likely to be resistant to the proposed developments		
MITIGATION: • Involve communities continuously in the construction process. • Implement proposed mitigation measures • Maintain a transparent approach to the EIA process • Provide for local employment				
POST-MITIGATION				
Duration	Short-term	Will be limited to the construction phase	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Localised impact		
Intensity	Low - negative	Allaying unjustified community / farmer fears regarding the project will reduce the potential resistance to the project		
Probability	Fairly likely	Effective implementation of the mitigation measures will contribute to the change in attitude of the communities towards the project		

8.4.1.16 Summary of the predicted SIA impacts and recommendations

Based on the discussion presented in the previous sections, it can be concluded that many of the significant socio-economic impacts of the proposed Swaziland Railway Link project will occur during their *construction phase*.

Positive impacts include temporary and permanent creation of *employment opportunities* as well as associated economic benefits and possible creation of opportunities for local sourcing of goods and services as well as anticipated positive impacts on local micro, small and medium enterprises.

Negative impacts include the potential influx of job seekers, creation of informal settlements, possible social pathologies arising from the influx of construction workers and job seekers, as well as increased traffic, damage to roads and impacts related to physical intrusion (dust, noise and vibration). Loss of access to communal resources such as water, grazing and fuel wood are other negative impacts related to the project.

The socio-economic environment in general poses no significant adverse socio-economic impacts of the construction of the proposed Swaziland Railway Link project. The preceding tables show that a total of 13 socio-economic impacts were identified for the project, of these 5 are positive and 8 negative. If all the mitigation measures are implemented according to the recommendations given, it is anticipated that the probability of most negative impacts will be minimized. This is particularly relevant where construction activities phase could affect the quality of life of adjacent households in terms of access, noise, dust, safety and security.

In conclusion, the proposed Swaziland Railway Link project poses a number of potential positive and negative social impacts. With appropriate measures, the negative impacts can be reduced to acceptable levels while the positive impacts can be maximised to provide significant benefits to the region. Measures must also be put in place to monitor and evaluate implementation of these mitigation measures and to take corrective action where necessary.

8.4.2 Socio-economic assessment

Due to the nature of assessing the socio-economic impact the project might have on the environment, it is necessary to view the impact holistically. Therefore, the findings presented in this chapter are representative of the entire Swaziland Railway Link project, and not only for that of the Golela to Nsezi railway line section. The complete specialist report can be found in Appendix B, Annexure I.

The capital investment in rail infrastructure for this project will boost the transport and export sectors in the respective economies. However, it will also have an immediate direct and indirect positive impact on the growth and development of South Africa and Swaziland. The economic impact analysis reveals a positive impact on major macro-economic variables such as Output, Gross Value Added (GVA), income and employment on the provinces of Mpumalanga and Kwazulu-Natal as well as Swaziland.

The impact evaluation uses economic multipliers from Social Accounting Matrices (SAMs). A SAM is a widely used tool to assess the macro-economic impact of changes in final demand induced by events such as large scale developments or shifts in policy.

In addition to the short-run implications of a large scale capital investment injection, the on-going operational expenditure effect on the provincial economies and Swaziland is estimated.

The static framework of the SAM will not be able to capture the structural changes occurring in subsequent years due to the construction of the rail link. The model only takes into account one particular shock to the system, while everything else is assumed to remain constant. Therefore the magnitude and direction of the response variables could have been cushioned or increased by other changes in the economy.

The CAPEX or investment is estimated at approximately R19 billion. The terms CAPEX and investment are used interchangeably in this report but are identical. In order to understand how this shock will affect and filter through

the respective economies it is important to understand how investments are recorded in the system of national accounts (SNA).

8.4.2.1 Capital investment expenditure

Investment in capital goods is the same as the concept of gross capital formation (GCF) in the SNA which includes produced capital goods (machinery, buildings, roads etc.). Gross capital formation measures the additions to the capital stock or the capacity to produce more goods and income in the future and is subdivided into gross fixed capital formation (GFCF) and changes in inventories.

GFCF includes all goods and services that can be used repeatedly for more than one year to produce other goods and services while changes in inventories include materials and supplies, work-in-progress, finished goods and goods for resale. Gross capital formation or capital investment is financed through savings by households, firms, government and foreign investment.

8.4.2.2 Gross domestic product

An economic impact is typically measured in terms of changes in labour income; employment; gross domestic product (GDP) or gross value added (GVA). Both GDP and GVA are measurements of final goods and services (output) produced within a region in a given period of time, serving as a measure of the size of a region's economy. GVA equals GDP plus taxes on products minus subsidies on products and is typically used for measuring gross *regional* domestic product of entities smaller than a whole economy.

GDP can be determined in three ways, all of which should, in principle, give the same result. They are the production approach, the income approach, and the expenditure approach. This study will use the production approach which calculates GDP as follows:

$$Total\ output\ by\ industries\ -intermediary\ inputs = GVA\ at\ market\ prices$$

$$GVA\ at\ market\ prices + \ taxes - subsidies = GDP\ at\ market\ prices$$

Capital projects create additional demands for labour, materials, technology etc. and increase production, both during construction phase as well as the operations. A macro-economic impact analysis evaluates and quantifies the effect of a capital project on the economy of a given area.

Imports of capital goods are excluded from the CAPEX estimates used in this study in order to isolate the effects on the local economy.

Economic multipliers from SAMs were used to estimate the effects of the capital project. Economic effects in terms of output, GVA, employment and income are calculated annually for the duration of the project period based on preliminary cash flow estimates. These annual estimates are then aggregated to give a lump-sum economic effect of the capital expansion for the duration of the project's construction phase as well as effects due to annual OPEX.

The estimated effects are based on the CAPEX and OPEX numbers, estimated at current 2013 prices, as reported in the FEL-2 study.

OPEX estimates used are the average cost of repairs and maintenance over the 24 analysis period for both rail and rolling stock.

8.4.2.3 Results of the assessment undertaken

The following sub-sections present and expand upon the applications and results of the analysis conducted. A separate analysis was done for each province, Mpumalanga and Kwazulu-Natal and for Swaziland. The CAPEX values were assigned to Mpumalanga, Kwazulu-Natal and Swaziland according to the three sections of the Swaziland Railway Link project, namely Mpumalanga, Swaziland and KwaZulu-Natal. Table 75 presents the CAPEX breakdown by work packages and regions.

Table 75 and Table 76 reflect the changes in final demand and were used as inputs for determining the macro-economic impact of CAPEX and OPEX.

CAPEX was apportioned to the respective provinces and Swaziland according to the cost breakdown per work package. Railway repair and maintenance (OPEX) were apportioned to the ratio of the rail track distances in the respective regions. Repairs and maintenance to rolling stock, locomotives and wagons, were apportioned to Mpumalanga and Kwazulu-Natal as no such activities are currently being performed in or planned for Swaziland.

Table 75: CAPEX of work packages assigned to Mpumalanga, Swaziland and KwaZulu-Natal

Location	Work Package	Description/ Start Location	Description/End Location	Primary Purpose
Mpumalanga	WP1A	Lothair	Nerston	New Link line
	WP2	Davel yard and Connections		New Terminal, network links
	WP3	Davel yard	Lothair	Line upgrade
Swaziland	WP1B	Nerston	Sidvokodvo	New Link line
	WP4	Sidvokodvo	Phuzamoya	Line upgrade (new line)
	WP5	Phuzamoya	Golela	Line upgrade (new line)
KwaZulu-Natal	WP6	Golela	Nsezi	Line upgrade (new line)

Table 76: Estimated capital expenditure (CAPEX) project values and imports (Current 2013 prices, Rand Million)

	Mpumalanga	Swaziland	KwaZulu-Natal	Total
Estimated Total Project Value	**4,965**	**7,850**	**6,344**	**19,159**
Domestic	**4,491**	**1,453**	**5,824**	**11,767**
Building & Construction	2,850	1,008	3,956	7,813
Mining & Quarrying	250	66	298	614
Manufactured goods	541	111	493	1,146
Wholesale & Retail Trade	9	1	-	10
Real Estate	71	43	183	297
Business Services	769	223	894	1,886
Imported Goods & Services	**474**	**6,397**	**520**	**7,392**

The loss of biological assets, forestry plantations and natural vegetation, due to expropriation and reclamation of land as well as the loss of production from such assets could be included in the CAPEX and OPEX changes in final demand, respectively. Such effects would reflect in negative changes in final demand due to reduced economic output.

Due to the lack of sufficient information regarding the quantum and value of the likely loss of biological assets, the effect was omitted from the analysis. Such reductions in final demand would lead to a marginal reduction in economic output and other metrics. It is possible to estimate the effects using the SAM multipliers.

8.4.2.3.1 Macro-economic impact results

The effects on total output associated with the total CAPEX as well as the annual effect of OPEX are summarised in and Table 78.

The output multiplier combines all direct, indirect and induced effects and shows the final increase in gross output of all the production activities. The output CAPEX ratio falls between 2.1 and 2.7 for both the provinces and Swaziland. Thus, for every one Rand increase in CAPEX, output increases between 2.1 and 2.7 Rand.

Table 78 represents the changes in GVA, in response to the projected capital expenditures. Similar to total output, Kwazulu-Natal experiences a greater effect on GVA than Mpumalanga and Swaziland. The gross value added is significantly lower than total output as it does not include all the intermediate consumption, inputs which are used in the production of final goods and services.

In addition, the gross value added portion in the form of factor payments to labour can be disaggregated by skills level. Representing the estimated effects as follow gives a sense of which skill groups are most likely to benefit from this capital project.

Table 77: Annual estimated total operational expenditure and capitalised operational expenditure (Current 2013 prices, Rand Million)

	Mpumalanga	Swaziland	KwaZulu-Natal	Total
Estimated total OPEX	**174**	**47**	**190**	**411**

Table 78: Macro-economic impact of CAPEX (Current 2013 prices, Rand Millions)

	Mpumalanga	Swaziland	KwaZulu-Natal	Total
Domestic CAPEX	**4,491**	**1,453**	**5,824**	**11,767**
Output	**9,443**	**3,938**	**15,622**	**29,003**
Gross Value Added	**2,199**	**1,024**	**4,064**	**7,287**
Labour	1,015	466	1,847	3,328
Skilled	300	187	740	1,227
Semi-Skilled	319	171	676	1,166
Unskilled	396	109	431	936
Capital	1,185	558	2,217	3,959
Income	**1,395**	**771**	**3,059**	**5,226**
Enterprises	450	225	894	1,569
Households	945	546	2,166	3,657
Low income	192	40	159	391
Middle income	232	120	477	829
High income	279	386	1,530	2,194
Employment creation	**14,910**	**9,415**	**16,513**	**40,838**

Unskilled and semi-skilled workers in all the regions will receive more than half of the increase in factor payments in the form of wages, to the equivalent of R715 million in Mpumalanga, R279 million in Swaziland and R1.1 billion in KwaZulu-Natal. Factor payments to skilled workers will increase by R300 million in the Mpumalanga, R187 million in Swaziland and R740 million in KwaZulu-Natal.

Annual employment effects during the construction period were estimated by using the assumed cash flows adjusted for imports. Retention of labour in subsequent years is incorporated. As labour demand increases with increased capital expenditure, it is assumed that 80 per cent of the previous year's labour would be retained. Employment created during a period is the difference between the total demand for labour and the retained labour from the previous period. More than 40 000 jobs could be created across all three regions during the construction phase of the project. This is not a reflection of permanent employment changes for the permanent residents but merely reflects the increases employment needed for the rail component construction located in each region. In addition, labour demand does not solely pertain to the unemployed but also includes people moving from one sector to the next. Employment at all levels is an increasing function of the total project value. KwaZulu-Natal experiences the greatest effects on employment.

The income effect focuses on the factor payments that are destined for Mpumalanga, Swaziland and KwaZulu-Natal households and enterprises, permanently based in the respective provinces. The income multiplier measures the additional income generated by households and institutions due to additional direct and indirect production activity. The size of the multiplier effect will depend on the structural features of the economy such as the component of domestically produced goods and the share of tradable and non-tradable goods in the consumption basket as well as the share of factor income actually received by households. The greater the import component of domestic consumption the greater the sum of funds not spent in the local economy. This is referred to as an import leakage which will decrease the multiplier effect

The income effect is much smaller than the gross valued added effect as a large portion of the wages and capital payments are accrued by enterprises and individuals residing outside of the provinces reflecting there leakages towards other provinces and abroad. Potential import leakages for the regions can be quite significant as the factors of production namely labour may not reside or spend their income in the province of interest. In addition, taxes and savings will decrease household disposable income and ability to purchase locally produced goods.

Income can be disaggregated by income group which gives a sense of which income groups are most likely to benefit from this capital project. High income earners in KwaZulu-Natal stand to gain much more relative to the other income groups. In Mpumalanga and Swaziland the income effect seems to be more balanced.

Table 79 represents the effects from the annual OPEX. Output increases substantially for all three regions whilst the change in GVA is relatively small, especially in Mpumalanga and KwaZulu-Natal. The annual labour demand for the on-going operations and maintenance amounts to 935 jobs.

Table 79: Macro-economic impact of annual OPEX (Current 2013 prices, Rand Millions)

	Mpumalanga	Swaziland	KwaZulu-Natal	Total
Annual OPEX	**174**	**47**	**190**	**411**
Output	**245.6**	**146.8**	**473.3**	**865.6**
Gross Value Added	**27.4**	**35.7**	**88.6**	**151.7**
Labour	13.1	17.1	40.6	70.7
Skilled	3.8	6.6	15.8	26.2
Semi-Skilled	4.1	6.3	15.0	25.4
Unskilled	5.2	4.2	9.8	19.2
Capital	14.3	18.6	48.0	80.9
Income	**17.5**	**27.0**	**65.1**	**109.6**
Enterprises	5.4	7.5	18.4	31.3
Households	12.0	19.5	46.8	78.3
Low income	2.4	1.5	3.5	7.4
Middle income	2.9	4.5	10.5	17.9
High income	3.7	8.0	19.0	30.7
Employment creation	**247**	**324**	**364**	**935**

The tables below describe the impact for macro-economic CAPEX and OPEX as well as proposed mitigation measures.

Table 80: Impact description for the Macro-economic CAPEX on a regional scale

IMPACT DESCRIPTION: Macro-economic CAPEX Regional				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Generation and sustaining of employment opportunities is the main concern for the communities surrounding the project area which will have long term downstream impacts on the economic activity of the area.	Consequence: Moderately beneficial	Significance: Moderate - positive
Extent	Regional	Localised impact		
Intensity	High - positive	Salary and wages earned will mostly be spent in the vicinity of the affected area		
Probability	Very likely	The project will generate jobs which will persist after the construction phase		
MITIGATION: Not Applicable				
POST-MITIGATION				
Duration	Short-term	Using local employment for permanent jobs will contribute to the local economy	Consequence: Highly beneficial	Significance: High - positive
Extent	Regional	Localised impact		
Intensity	Very high - positive	Increased employment levels will increase local economy		
Probability	Very likely	Mitigation will further enhance the positive impacts of the project		

Table 81: Impact description for the macro-economic CAPEX on a local scale

IMPACT DESCRIPTION: Macro-economic CAPEX Local				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Creating employment will increase the spending regime in the area. Long term jobs will persist for the life span of the project	Consequence: Moderately beneficial	Significance: Moderate - positive
Extent	Local	The project could also have fiscal impacts. Payment of business and personal tax could contribute to government revenue at a national level, while rates and payment for services could strengthen the income base of the district and local municipalities		
Intensity	High - positive	Local expenditure by employees will have multiplier effects in various sectors of the economy, thereby stimulating business activity and further employment creation		
Probability	Very likely	Increased employment levels will contribute to the economy		
MITIGATION: Not Applicable				
POST-MITIGATION				
Duration	Short-term	increased levels of employment will persist for the duration of the project	Consequence: Moderately beneficial	Significance: Moderate - positive
Extent	Local	As per pre-mitigation		
Intensity	High - positive	As per pre-mitigation		
Probability	Very likely	As per pre-mitigation		

Table 82: Impact description for the macro-economic OPEX on a regional scale

IMPACT DESCRIPTION: Macro-economic OPEX Regional				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Creating employment will increase the spending regime in the area. Long term jobs will persist for the life span of the project	Consequence: Moderately beneficial	Significance: Low - positive

Extent	Regional	The project could also have fiscal impacts. Payment of business and personal tax could contribute to government revenue at a national level, while rates and payment for services could strengthen the income base of the district and local municipalities		
Intensity	Low - positive	Local expenditure by employees will have multiplier effects in various sectors of the economy, thereby stimulating business activity and further employment creation		
Probability	Fairly likely	Increased employment levels will contribute to the economy		
MITIGATION: Not Applicable				
POST-MITIGATION				
Duration	Long-term	increased levels of employment will persist for the duration of the project	Consequence: Highly beneficial	Significance: Moderate - positive
Extent	Regional	As per pre-mitigation		
Intensity	Moderate - positive	As per pre-mitigation		
Probability	Fairly likely	As per pre-mitigation		

8.4.2.4 Conclusion

The proposed rail link between Davel - Lothair (South Africa) and Sidvokodvo (Swaziland) as well as additional upgrades to existing railways would have a significant macro-economic impact on the provinces of the Mpumalanga and KwaZulu-Natal as well as Swaziland. This is illustrated through the estimated changes in economic metrics caused by the changes in final demand during the project construction and operations, maintenance and upgrades.

The effect of the estimated project expenditure on employment, total output and value added were estimated. This was conducted on provincial level by the use of multipliers of Social Accounting Matrices.

It should be noted that the macro-economic impacts reported are high-level estimates based on estimated costs of preliminary designs. These figures are indicative of nature and should be treated as such. The rail link and additional infrastructure works are expected to have a robust positive effect on the economies of the Mpumalanga, KwaZulu-Natal and Swaziland.

The economic effects due to the loss of biological assets, plantations and vegetation, as a result of expropriation could not be estimated due to the lack of information regarding asset values and loss of annual economic outputs.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The project is currently fast-tracked to an aggressive completion programme. By virtue of its international nature, cohesive and wide-ranging inter-governmental co-operation remains one of the key pillars to success. The creation of a strategic link between South Africa and the export Ports of Richards Bay and Maputo, through Swaziland, has been found to be technically feasible, with certain risks attached.

Two possible corridors are proposed and the potential impact of the construction of the railway line on the environment needs to be assessed in terms of the process prescribed by the National Environmental Management Act, 107 of 1998.

Network upgrades

The additional demand on parts of the network brought about by increase in traffic volume from sources other than Mpumalanga and central Gauteng make upgrades of the network a critical planning driver. Expected Limpopo traffic is a major contributor to demand capacity on the southern section of the corridor. This refers particularly to the Phuzamoya-Nsezi section which has the addition of growing North-South line traffic to deal with. This fact should not be permitted to cloud or delay the original strategic intent, namely, to create a new rail link between Swaziland and South Africa.

In summary:

- The upgrade of the existing rail network from Davel to Lothair and from Sidvokodvo to Nsezi is key to the project feasibility, reflected in the viability of the new link section;
- Certain network upgrade activities equal or even surpass the new link in length and scope of civil works required. This is particularly true in respect of the section Sidvokodvo-Phuzamoya to Nsezi;
- Critical infrastructural elements are introduced under route upgrades, including:
    - Davel Yard. Penultimate Work Package, due to long term nature of load consolidation, but will be required for 200 wagon functionality;
    - New line between Breyten and Buhrmanskop, including links for existing and future traffic access and major Level Crossing elimination benefit;
    - New junctions at Lothair and Phuzamoya; and
    - New line between Sidvokodvo and Nsezi, (excluding Pongola River bridge and Mtubatuba tunnel) creating bypass lines at the towns of Golela, Mtubatuba and Hluhluwe.
- All public level crossings will be eliminated where practicable;
- Upgrades can be achieved with minimum disruption to current operations; and
- The line between Buhrmanskop and Lothair will need to be closed for the Commodities originating from Lothair will need to be transported by road to Buhrmanskop.

The above, notwithstanding that there are many planning and construction aspects (activities) and many areas of environmental concern attached to the project.

These arise by virtue of:

- The topography of the area, linked to stringent route geometry factors required to meet the design criteria for heavy haul operations as planned.
- The intensity of earthworks required (high banks and deep cuttings) as well as the number and size of structures involved.
- The rural nature of large sections of the route, environmentally sensitive land use (forestry, subsistence farming) and long linear impact on riverine / floodplain farming and land use.
- Point-type areas of impact such as the proximity to the Westoe Dam near Lothair and the Usuthu River and numerous other river and stream crossings.
- The impact on human settlement, particularly the rural settlement patterns prevailing in the Swaziland section and in the rural areas of KwaZulu-Natal of the project.
- The successful conclusion of the EIA process, culminating in Authorisations valid in each of the Partner States is critical to the viability of the Project, timeous commencement of the Works and commencement of train operations according to the agreed programme in the 2nd Quarter of 2017.
- The EIA process will be complex from management and technical perspectives and exhaustive in extent by virtue of:
    - The multinational nature of the project;
    - Complexities inherent in differing legal and governance requirements per Partner State; and
    - The sensitive bio-physical and social setting of the project.

Other permitting processes must not be overlooked in the need to obtain environmental approval under the respective country regulations. Factors such as the need for water use or borrow pit licences need to be clarified as soon as possible, since these processes can be extensive.

An exhaustive and dedicated Stakeholder Engagement Plan (internal as well as external) has been compiled for early implementation. Social impacts in the form of site camp labour requirements are identified.

At this stage the direct labour force could reach 2 180 units, with a potential value of ZAR 2 080 million. This comprises labour components of both construction activities as well as material supply. The Swaziland / RSA split is estimated at approximately 45% / 54%. Viewed as an on-going project, the estimated annual labour budget to operate the corridor amounts to ZAR 115 million. This comprises direct personnel in the fields of Movement, Train Control and Yard functions, as well as Rolling Stock and Infrastructure maintenance.

The “Equator Principles” established by the Equator Principles Financial Institutions are described for applicability to the project. Visible compliance to this set of voluntary guidelines for the financing industry in assessing environmental and social risks is a prerequisite for funding and investment purposes. The criteria of the Equator Principles as applicable to the project are met.

The construction activities associated with the upgrade of the railway line from Golela to Nsezi and the Nsezi Yard development as proposed by Transnet potentially has certain impacts on the environment. These potential impacts are both positive and negative.

Positive impacts associated with the project include the following:

- Creation of employment opportunities;
- BEE opportunities;

- Creation and or sustaining of employment opportunities during the operational phase;
- Benefits to the local and regional economies during the operational phase;
- Macro-economic benefits at regional and local levels during the construction phase; and
- Macro-economic benefits at regional level during the operational phase.

Negative impacts associated with the project include *inter alia*:

- Potential loss of corridors and habitat fragmentation;
- Noise pollution during the construction and operational phases;
- Physical intrusion through noise and air quality pollution and impact on sense of place during the construction phase;
- Potential for contamination through hydrocarbon spillages.

While all the mitigation measures as recommended by the specialists were carefully considered, few of these were found to be unfeasible for the proponent to implement. An example of such unfeasible mitigation measures includes the minimisation of train activity during night times to reduce the impact of noise on nearby dwellings. While all the recommended mitigation measures are captured in the specialist reports (contained in Appendix B), only the feasible and realistic mitigation measures are captured in this report. Such feasible mitigation measures are also included in the EMP (Appendix E).

Through identified mitigation measures the positive impacts of the project can be enhanced and the potentially negative impacts reduced. Impacts associated with the type of project such as for example railway noise during the operational phase cannot be avoided entirely but with appropriate mitigation measure the impact could be alleviated.

None of the potential negative impacts of the project can be considered a significant long term negative consequence on the affected social and biophysical environment that is extremely difficult to mitigate or undesirable to promote, in other words an environmental fatal flaw.

An issue that runs like a golden thread through the process is that the local communities and other stakeholders such as the farming and forestry community must be taken on-board for the entire project. The goodwill of these stakeholders is paramount for the success of the construction of the railway line and Nsezi Yard which is a crucial element of the entire project to establish a railway link between Mpumalanga and Richards Bay through Swaziland.

Aurecon is of the opinion that the information contained in this dEIA Report and the associated documentation will enable the DEA to make an informed decision that the proposed construction of the Golela to Nsezi railway line and associated infrastructure can proceed.

9.2 Recommendations

Taking into account the mitigation measures proposed by the specialist as well as those contained in the EMP, the EAP is of the opinion that the potential impacts posed by the proposed development can be adequately mitigated to prevent detrimental impacts to the environment. The Authority is reminded that, as described in Chapter 8, **many of the mitigation measures proposed by the specialists in their various reports were found to be totally unfeasible** to implement and were therefore out-motivated in Chapter 8. **The feasible mitigation measures as well as alternative mitigation measures are captured in the EMP.**

It is therefore recommended that the DEA considers the EIA Report and issues an Environmental Authorisation to Transnet to proceed with the construction of the railway line and associated infrastructure.

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Appendix A
Curriculum Vitae

Annexures:

A: Pieter Botha

B: Candice Dürr

C: Elise Vermeulen

Appendix B
Specialist Reports

Annexures:

A: Ecological

B: Geohydrological impact assessment

C: Hydrological impact assessment

D: Waste management plan

E: Social impact assessment

F: Air Quality impact assessment

G: Noise impact assessment

H: Heritage impact assessment

I: Socio-economic impact assessment

J: Plan of Study for EIA

Appendix C
Public Participation

Annexures

A: BID and landowner notification letters

B: Proof of landowner notification

C: Newspaper advertisements

D: Site notices

E: Request for assistance with landowner details

F: I&AP database

G: Issues and Response Report and minutes of public meeting

H: Proof of notification of DSR

I: Proof of notification of FSR

J: Proof of notification of AFSR

K: Comments received

L: Attendance registers

M: Presentation for public meeting

Appendix D Communication with authorities

Annexures

A: Exemption Application

B: Application from

C: Rejection of application form

D: DEA application acceptance

E: DEA rejection of SR

F: DEA approval of amended SR

G: KZN Independence of Specialists communication

Appendix E
Environmental Management Programme