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Environmental Impact Assessment: The Proposed Upgrade and new Construction related to the Development of the Swaziland Rail Link Project, From Davel to Nerston in Mpumalanga

Environmental Impact Report

DEA Reference: 14/12/16/3/3/2/553

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ABBREVIATIONS AND ACRONYMS

AD	Anno Domini
AEL	Atmospheric Emission Licence
ASGISA	Accelerated and Shared Growth Initiate for South Africa
AQIA	Air Quality Impact Assessment
BID	Background Information Document
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DRO	Diesel Range Organics
DM	District Municipality
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
EIR	Environmental Impact Report
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
ENIA	Environmental Noise Impact Assessment
ESA	Early Stone Age

FEL	Front End Loading
GIS	Geographic Information System
GNR	Government Notice
GPS	Global Positioning System
GRO	Gasoline Range Organics
GSDM	Gert Sibande District Municipality
GVA	Gross Value Added
HIA	Heritage Impact Assessment
IDP	Integrated Development Plan
I&APs	Interested and Affected Parties
IRR	Issues and Response Report
MAP	Mean Annual Precipitation
LIA	Late Iron Age
LM	Local Municipality
LSA	Late Stone Age
MAR	Mean Annual Run-off
MAT	Mean Annual Temperature
MDEDET	Mpumalanga Department of Economic Development, Environment and Tourism
MEC	Member of Executive Council
MEGDP	Mpumalanga Growth and Development Path
MOU	Memorandum of Understanding
MPGDS	Mpumalanga Provincial Growth and Development Strategy

MRDP	Mpumalanga Rural Development Programme
MSA	Middle Stone Age
Mtpa	Million tonnes per annum
MTPA	Mpumalanga Tourism and Parks Agency
NATMAP	The National Transportation Master Plan 2050
NEMA	National Environmental Management Act, 107 of 1998
NEM:WA	National Environmental Management: Waste Act, 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Atlas
NSD	Noise Sensitive Development
NSDP	National Spatial Development Perspective
NWA	National Water Act, 36 of 1998
PES	Present Ecological Status
PLP	Project Lifecycle Process
PPP	Public Participation Process
PoSfEIA	Plan of Study for Environmental Impact Assessment
SAHRA	South African Heritage Resource Agency
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
SIA	Social Impact Assessment

SG	Surveyor-General
SOC	State-Owned Company
SR	Scoping Report
STD	Sexually Transmitted Disease
Steercom	Steering Committee
t/axle	Ton per axle
UPVC	Unplastised Polyvinyl Chloride

GLOSSARY OF TERMS

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 (EMPr):	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.
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.

EXECUTIVE SUMMARY

INTRODUCTION

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

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. The following table summarises the applicable listed activities in terms of NEMA which are being applied for:

Table 1: Summary of listed activities applied for which are triggered in terms of NEMA

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 Davel to the Swaziland border in Mpumalanga
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 1000 m 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 50 m^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 500 m^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

Number and date of relevant notice	Activity No (s) (in terms of the relevant notice)	Description of listed activity as per the project description
		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 50 m^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 50 m^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.
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 4 m. 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 80 m^3 which might occur within the geographical areas identified in the listing notice. This will be confirmed through specialist studies.

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	12 (a) & (b)	The construction and the upgrade of the railway line will constitute removal of indigenous vegetation in areas that exceed 300 m^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 1 ha 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 of indigenous vegetation with the total area that exceeds 5 ha 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 10 m^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 & 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 10 m^2 or more within a watercourse or within 32 metres of a watercourse.

This document outlines the process followed, describes the proposed development and the context in which it will take place, and identifies the potential environmental 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.

INTRODUCTION TO THE PROJECT TEAM

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 Practitioner	Mrs 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

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 were afforded the opportunity to raise issues of concern that were recorded and included in the Final Scoping Report. In addition to this, I&APs were again afforded an opportunity to comment on the draft Environmental Impact Report (EIR). This ensured that the stakeholder concerns are captured into this final EIR which will be submitted to the DEA for review.

The public participation process was initiated by the placement of an advertisement, in the prescribed format, in a regional (The Highvelder, Mpumalanga) and national (Die Beeld, Afrikaans Edition) newspaper on 25 and 27 June 2013 respectively. 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.

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 in 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. Construction phase impacts could potentially include the following:

- **Direct impacts:**
  - Visual impact of the infrastructure;
  - Windblown dust from excavations and upgrade activities;
  - Impact on ambient noise levels;
  - Litter/waste production;
  - Impact on terrestrial flora
  - Impact on terrestrial fauna;
  - Impact on aquatic ecosystems;
  - Erosion;
  - Sedimentation;
  - Loss of topsoil;
  - Traffic impacts;
  - Deterioration of water quality; and
  - Temporary employment opportunities.
- **Indirect impacts:**
  - Windblown dust from access roads;
  - Disturbance to adjoining landowners;
  - Security risks; and
  - Social impact on local communities.

It should be noted that an Environmental Management Programme (EMPr) has been developed to regulate and minimise the impacts during the construction phase and forms part of this final EIR. The EMPr is attached in Annexure E.

The potential positive and negative operational phase impacts that were identified in the Scoping Phase can be divided into three categories; namely impacts on the biophysical environmental, the social, economic and cultural environment. The following potential impacts are investigated in detail in Chapter 8.

- **Impacts on the biophysical environment:**
  - Ecological;
  - Hydrological;
  - Air Quality,
  - Geohydrological; and
  - Noise and vibration.
- **Impacts on the social, economic and cultural environment:**
  - Social;
  - Economic and socio-economic; and
  - Cultural, heritage and archaeological.

CONCLUSION

The EIR provides a description of the feasible alternatives and potential impacts identified during the Scoping and Environmental 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.

Contents

Appendices

Figures

Tables

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 Davel and Nsezi in KwaZulu-Natal. The details of the Environmental Assessment Practitioner (EAP) is summarised in section 1.1 below.

1.1 Context of this report

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

Table 2: 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*
	(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 –*	*Chapter 1*
	(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 (the public participation process)*

	(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*	*Chapter 8*

	impact assessment process, an assessment of the significance of each issue and an 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*	*Appendix B*

	specialised processes complying with 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

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 Environmental Impact Assessment (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 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.

Dr Botha is registered as an Environmental Assessment Practitioner with the International Institution for Impact Assessment (South Africa).

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 EMPr to the relevant authority. Liaise with authorities, stakeholders and specialists. Compilation of the water use licenses for the entire alignment.

Mrs Dürr completed her Honours degree in BSc Environmental Management at the University of Pretoria in 2013.

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. Mrs Dürr is a qualified Environmental specialist and obtained her Bachelor of Science from the North West University. Mrs Dürr completed her Honours degree in BSc Environmental Management at the University of Pretoria in 2013.

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 EMPr 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 years' 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 3: Details of the EIA project team

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
Paleontological Assessment	Gideon Groenewald	PGS Heritage
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 Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) 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 (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.

Each of the three 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 2 as mentioned above, i.e. from Davel to Nerston (ref no: 14/12/16/3/3/2/553).**

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

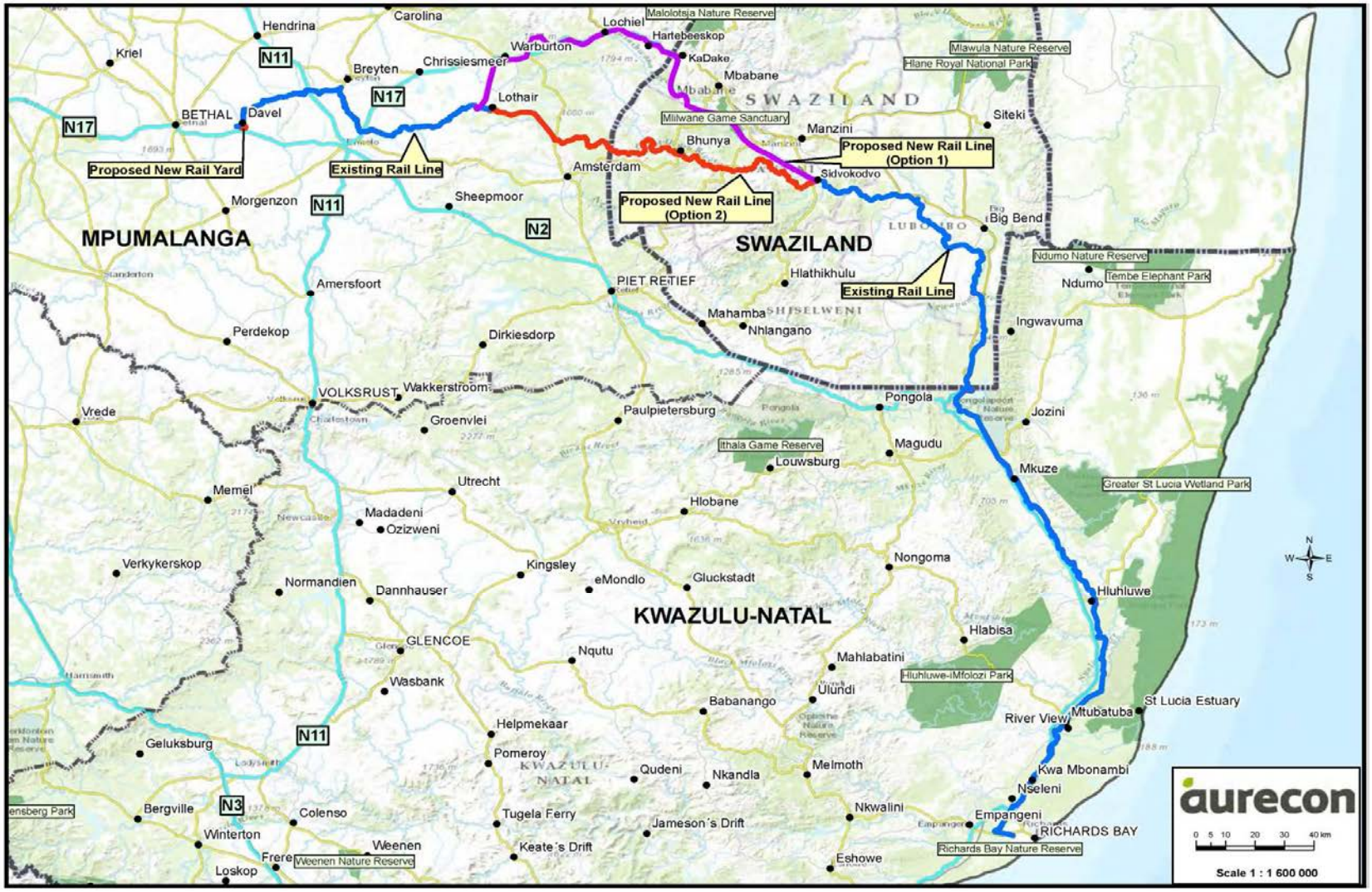

Figure 1: General layout of the entire Swaziland Railway Link from Davel to Nsezi, The red and purple lines indicates the new link alternatives from Lothair to Sidvokodvo. The blue line represents upgrade and construction sections of the existing railway line

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; and
- 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. Refined estimates for all network upgrades indicate a cost of approximately ZAR 12 230 million.

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 Proposed alignment alternatives for the Swaziland Railway Link Project

Initial concept-level routes identified for a possible South Africa-Swaziland link as per the Transnet Group Planning's Swaziland Rail Link FEL-1 Study are provided in Figure 2.

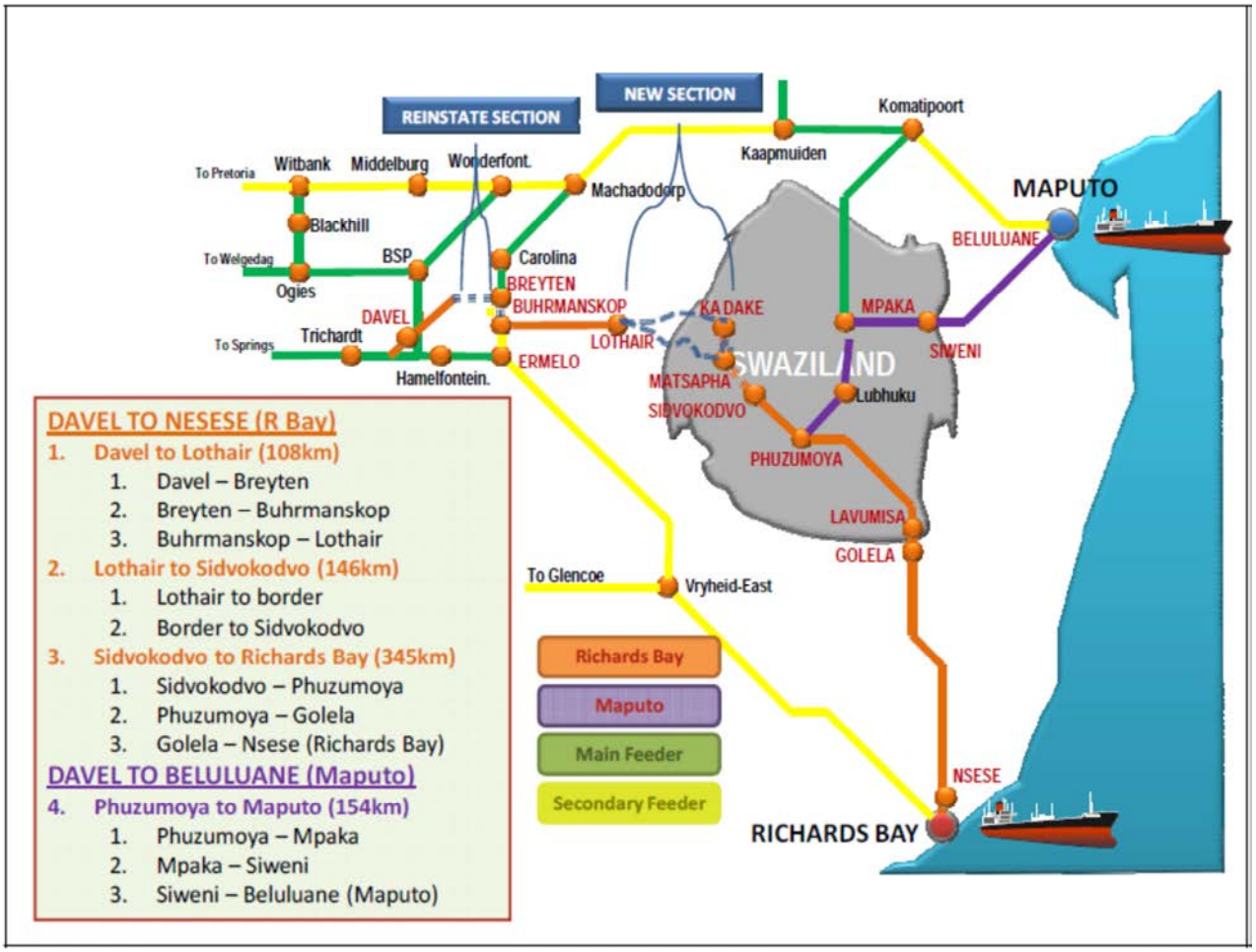

Figure 2: Initial concept level routes from the FEL 1 report indicating the exisiting infrastructure.

The purple portion in Figure 2 indicates a possible Mozambican link which does not form part of the current study and **can therefore be ignored**.

Key to the project feasibility was to understand the *status quo* of the existing network segments connecting to the new strategic rail link between Lothair and a suitable point in Swaziland. This point was identified as Sidvokodvo. The main route lines include primarily the South African hinterland connecting from Davel in Mpumalanga and portions of the Swaziland East-West and North-South lines.

In this chapter, first the upgrading of the existing infrastructure is described, where after the different alternative route options for the **new rail link** between Lothair and Nerston are described.

1.6.1 Alternatives assessed for upgrading of existing infrastructure

Track and installed infrastructure, train control, traction and traction change facilities, yards and terminals as well as the prevailing operating regime were identified per logical segment of the planned routes. Some of the key alignment and other factors identified in a particular section as being relevant in the rail project context are highlighted below. This serves as the assessed alternatives for the upgrading of existing infrastructure:

Ermelo – Buhrmanskop:

The line has a 3.5 km long section of 1:50 gradients (as opposed to the required 1:66 gradients) against loaded trains as well as three road crossings which cannot be easily eliminated. Train length would be limited to only 50 wagons as opposed to the desired 200 wagon train length.

The line is also presently only served via Ermelo Yard. Traffic anywhere near the target tonnage (15 Mtpa) will materially affect the same heavy haul traffic on the coal line which the project is strategically attempting to ease.

A direct link from the Broodsnyersplaas side of Ermelo Yard is technically possible, but involves an additional crossover on the main line, affecting Coal Line operations which is undesirable. It also passes through high density residential areas and involves a further two road / rail grade separation structures.

Due to these reasons, a link using the Ermelo-Buhrmanskop section is deemed fatally flawed and the Davel-Breyten-Buhrmanskop route was then addressed as an alternative to reach Lothair.

Davel – Lothair:

Davel provides an outstanding network connection point, after the provision of connecting links. It functions as a traction change yard and diverts traffic from the Coal Line 45 km before Ermelo.

Reinstatement of the section between Estancia and Breyton as well as doubling of the line from that point to Buhrmanskop to accommodate existing traffic will be required.

All sections will require upgrading in the form of track and formation rehabilitation, easing of curves and gradients as well as realignment or deviations outside of the rail reserve to achieve the objective.

Outcome of the FEL1 feasibility study for the Davel to Lothair section:

The feasibility assessment conducted as mentioned above concluded that the Davel Yard be utilised as the network connection point. From Davel, the existing infrastructure will be upgraded to Lothair via Breyton and Buhrmanskop as per Figure 2. Note that while the upgrading of existing infrastructure will mainly occur inside the existing Transnet servitude, as a result of the increase in the axle tonnages to a 26 ton axle (i.e. a stronger railway line to accommodate a heavier 200 wagon train) which prevent the railway line from making steep turns, certain servitude boundaries (especially around bends) will be exceeded at times.

1.6.2 Initial alternatives for the new rail link assessed prior to the Scoping Phase

The following section describes the initial alternatives for the **new rail link** considered by Transnet prior to the commencement of the Scoping Phase of the project. During the Scoping Phase, however, a new alternative for the

new link section from Lothair to Nerston was proposed by the Lothair farmers. This new alternative is described in section 1.6.3.

1.6.2.1 Alternative assessment for the new Swaziland Railway Link from Lothair to Sidvokodvo:

The alternative routes under consideration at concept level were the following four possible connections to the Swaziland Railway network (Figure 3):

- New route option 1: Lothair to Ka Dake with the possibility of resuscitating the Ka Dake to Matsapha line and upgrading of the section from Matsapha to Phuzumoya Junction
- New route option 2: New line from Lothair to Matsapha and upgrading of the Matsapha to Phuzumoya Junction
- New route option 3: New line direct from Lothair to Phuzumoya Junction
- New route option 4: New line direct from Lothair to Mpaka
- Mpaka to Maputo was also considered, however Transnet decided that this option would be revisited at a later stage and is thus not part of this project.

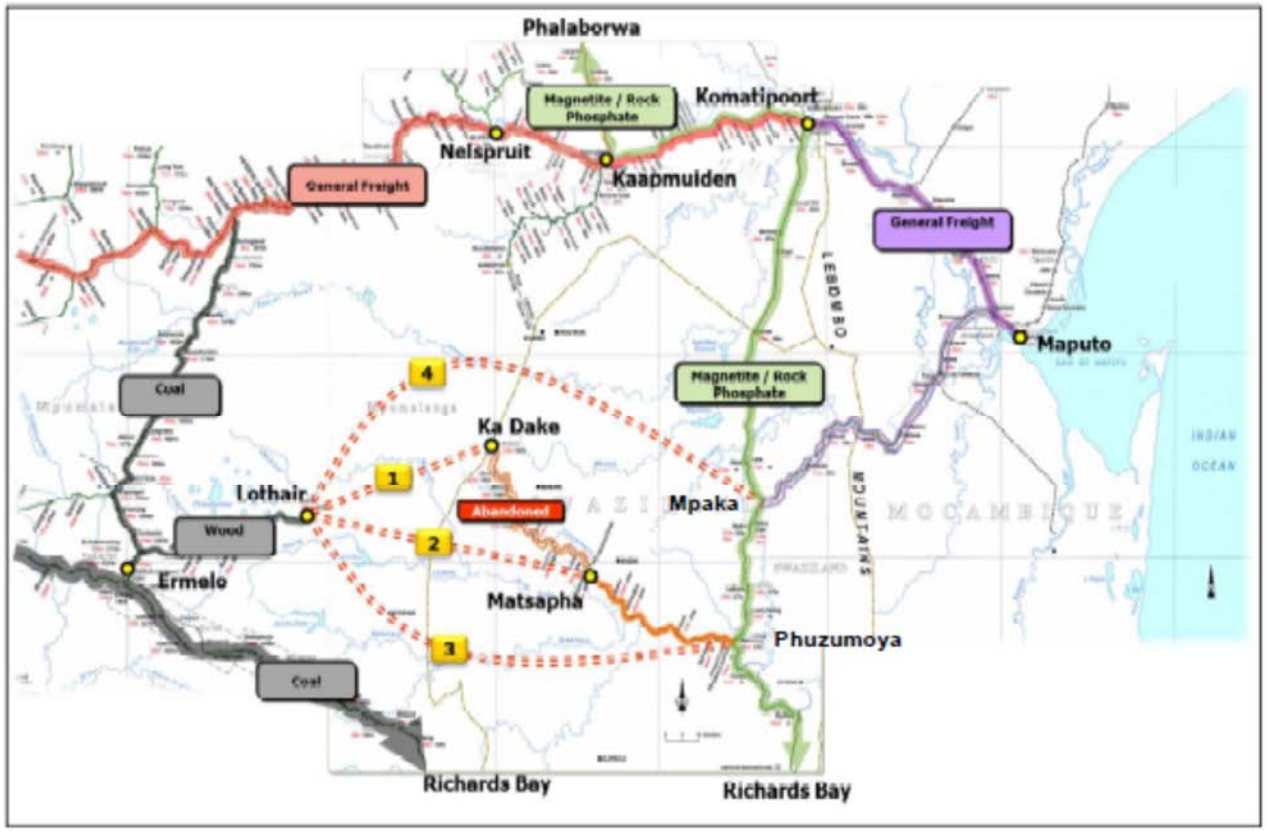

Figure 3: Initial alternative routes identified for the Swaziland Railway Link alignment

Note that although the entire route alternative for the new rail link is explained, **this report only pertains to the section from Davel to the Swaziland Border in Mpumalanga**. Davel to Lothair will consist of various upgrade construction activities, whilst Lothair to the Swaziland Border is envisaged as a new railway line to be constructed (i.e. not in an existing servitude).

Therefore, the four "new route options" as set out above were considered as the alternatives for the entire Swaziland Railway Link project (i.e. from Davel to Nsezi in Richards Bay).

Concept level assessments for the new rail link

To ascertain whether the above mentioned four new route alternatives would be feasible, the following approach and methodology was adopted:

Approach

The study comprised a high-level investigation of available literature and data (including mapping) for the four routes in order to identify environmental fatal flaws, considerations and possible constraints.

Methodology

The four new route options for the possible connection of the Swaziland Railway network were overlaid on available Geographic Information Systems (GIS) maps of South Africa and Swaziland including protected areas, perennial rivers and inland water bodies, plantations, towns and urban and rural settlements. This information was supplemented by satellite imagery. Additional information on proposed protected areas and vegetation types was also utilised.

Apart from noting areas of concern as per the overlaid maps, available literature was researched with respect to environmental sensitivities identified within the study area.

Where possible, the alignment was compared with any geo-referenced information available in the literature.

Conclusion

Utilising available information such as possible freight demand projections, land use, geological, topographical and existing infrastructure maps, geotechnical investigations, land surveys, early pre-feasibility assessments conducted by Transnet and the appointed engineering consultancy firms deemed new route options 3 and 4 technically and financially unfeasible. As such, these two options were disregarded for further assessment and will not be looked at during the EIA process.

On the basis of the above findings being included and approved in the feasibility level report, only the two potential new route options 1 and 2 as mentioned below were taken forward for further study, namely:

- New route option 1: A new line from Lothair to Ka Dake with the possibility of resuscitating the Ka Dake to Matsapha section and the upgrade of the existing Matsapha to Phuzumoya line; or,
- New route option 2: A new line from Lothair to Sidvokodvo (and the upgrade of the existing section to Phuzumoya Junction).

To ensure all options were taken into account, possible variations to both of these two new route options were considered as well.

Alternative option for new route 1

- *Route option 1A – Restore the status quo*

A variant on route option 1, namely to merely reinstate the Ka Dake to Matsapha section to its former alignment geometry and not carry out any upgrading between Matsapha and Sidvokodvo could be considered.

The consequences of such an option would be that the section would only carry 40 wagon trains or 40 % of the potential traffic load. This in turn affects the viability of Route Option 1, since this ruling train length and load applies to the whole corridor envisaged under Route Option 1. This constraint when viewed from a system perspective is deemed to constitute a project variance of such significance as to constitute a fatal flaw in the option.

Alternative option for new route 2

- *Route option 2A – New route with spur line from Sidvokodvo to Ka Dake*

Coupled to route option 2 (new link between Lothair and Sidvokodvo), the possibility exists to reinstate and upgrade the Ka Dake to Matsapha and Matsapha to Sidvokodvo sections respectively. This would serve as a self-contained spur line, if and when commercial imperatives render this necessary. This implies restoring the *status quo* and reverting to a shuttle service method of train operation and traffic planning practised previously when the Ngwenya mine was in operation.

The work comprises reinstatement and upgrading work according to the existing alignment with no external deviation or easing of curves and grades, in this sensitive environment. By implication:

- The line operates as a spur (40 / 50 wagon trains) at 20 t / axle;
- The lower capacity of the spur does not affect the capacity of the export corridors planned from Lothair to Richards Bay or Maputo, since mainline standard traffic does not travel across it;
- Sidvokodvo functions as a consolidation yard for Ka Dake traffic, roughly as in the past;
- From Sidvokodvo, Ka Dake traffic could be consolidated into longer freight haul (maximum 100 wagon consists) consigned to Maputo or Richards Bay. This economy of scale, albeit at a lighter axle load, was not available previously on the existing, non – upgraded Sidvokodvo to Phuzumoya section linking to the Swaziland Rail north – south line; and
- Work associated with Route Option 2 in no way sterilises the potential implementation of Option 2A. Network planning in and around Sidvokodvo can be readily adapted to cater for this eventuality.

Option 2A can be implemented if and when the commercial demand warrants the investment. However, the current development does not include the further implementation of this option.

1.6.3 New "Farmers" Alternative (alternative 4)

During the scoping phase undertaken by Aurecon as part of the prescribed EIA process, a potential alternative alignment was proposed by the affected land owners in Lothair for the portion of the alignment stretching from the Westoe Dam up to the Swaziland border which for the most part run parallel to the existing road from Lothair to Nerston. This was proposed so as to alleviate the impact the new railway line would have on the farmers' property.

However during the technical feasibility assessment undertaken by the project engineers it was found that the new proposed alignment was not feasible due to various technical issues.

The new proposal was further investigated by the project engineers during October and November 2013, during which investigation variations on alternative alignments were identified, named alternatives 4 and 4a, and were determined to be technically feasible (see Figure 4).

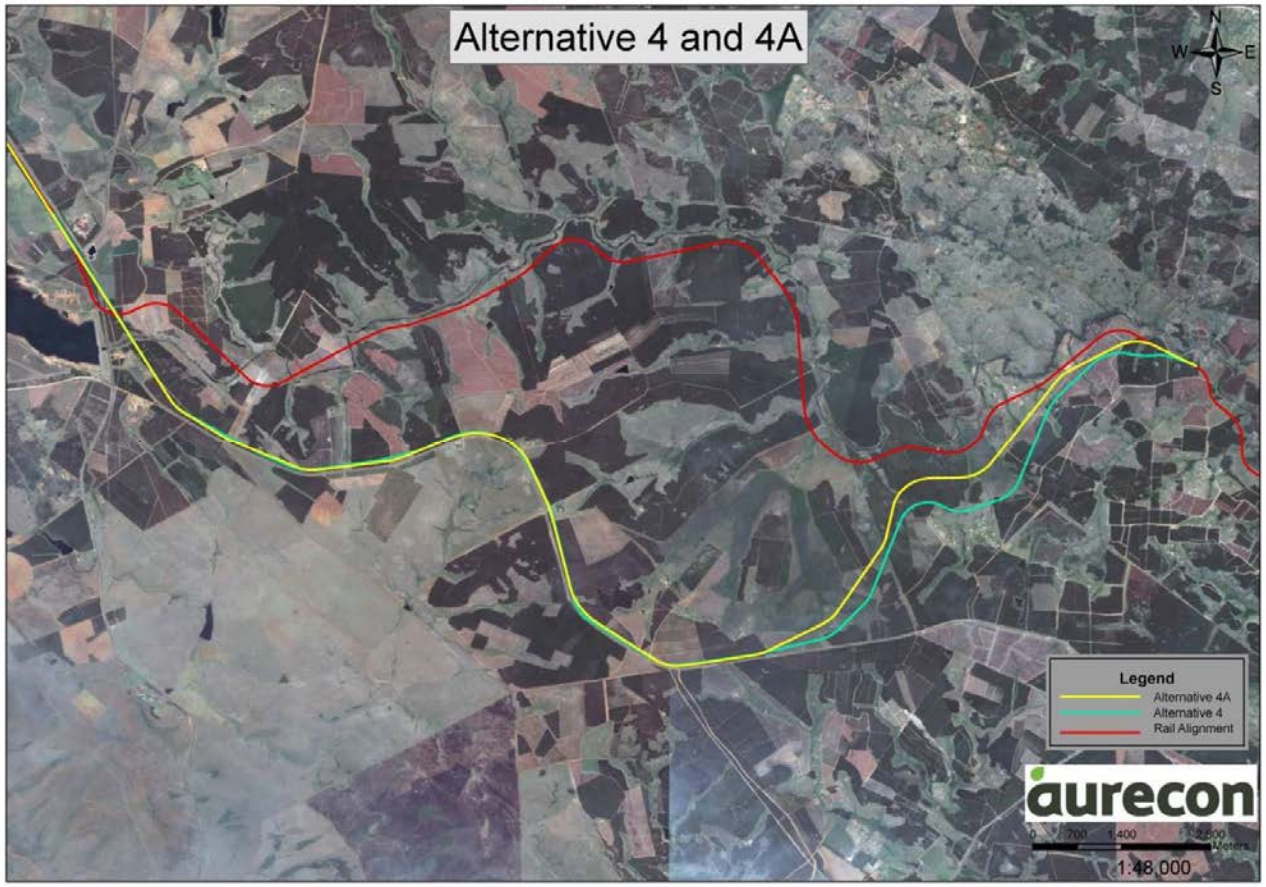

Figure 4: New alternative alignment 4 and 4a identified, stretching from Westoe Dam to Nerston.

As these two new alternatives were found to be technically feasible by the project engineers, they were formally subjected to the EIA Process and investigated by Aurecon and a team of specialists. The investigation determined the impacts associated with the alignment, recommend mitigation measures to limit the anticipated impacts and determine whether the alignment can be implemented successfully without significant detrimental impacts to the environment.

The alignment was subjected to the following specialist investigations:

- Hydrological assessment;
- Social impact assessment (including possible resettlement of affected communities and/or people);
- Geohydrological study;
- Ecological assessment;
- Wetland assessment and delineation;
- Air quality assessment;
- Noise and vibration studies;
- Cultural/archaeological assessment; and
- Paleontological assessment.

The above investigations served to identify areas of concern or potential no-go areas and provided site specific mitigation measures. Note that the original alignment was also subjected to the above investigations in order to ensure a comparative assessment of the alternative route alignments.

Stakeholder consultation was also undertaken in order to identify all potential issues.

1.6.4 Davel to Lothair railway line to be upgraded

The existing railway line from Davel to Lothair (via Breyton and Buhrmanskop) will be upgraded to accommodate a 26 ton/axle line. This heavier railway line and subsequent longer, heavier trains will require a minimum radius of 300 m. Many of the current turns of the existing railway line are too sharp too accommodate the envisaged heavier trains. Therefore, while Transnet will endeavour to remain within the existing railway servitude, there will be various areas where short sections of new railway line will need to be built to accommodate the slackening of the railway line turns.

In such areas where new railway line will be built for these slackened turns, Transnet will be required to completely uplift the old railway line (the steep turns) and rehabilitate the area according to EMPr specifications.

1.6.5 Alternatives taken forward

After taking the above mentioned alternatives and their relative assessments into account the following alternatives were considered feasible to be taken forward into the EIA phase:

- Davel to Lothair via Breyton and Buhrmanskop alternative for the upgrading of existing infrastructure;
- New route option 1: A new line from Lothair to Ka Dake with the possibility of resuscitating the Ka Dake to Matsapha section and the upgrade of the existing Matsapha to Phuzumoya line;
- New route option 2: A new line from Lothair to Sidvokodvo (and the upgrade of the existing section to Phuzumoya Junction); and
- The new “farmers’ alternative”, named alternatives 4 and 4a for the section from Westoe Dam to Nerston.

Due to the fact that new route option 1 (Lothair to Ka Dake) was found to traverse the Milwane Nature Reserve in Swaziland, this option was considered to be **fatally flawed** and was therefore not assessed during the EIA phase of the project.

The following figure indicates the alternative routes taken forward in the EIA phase:

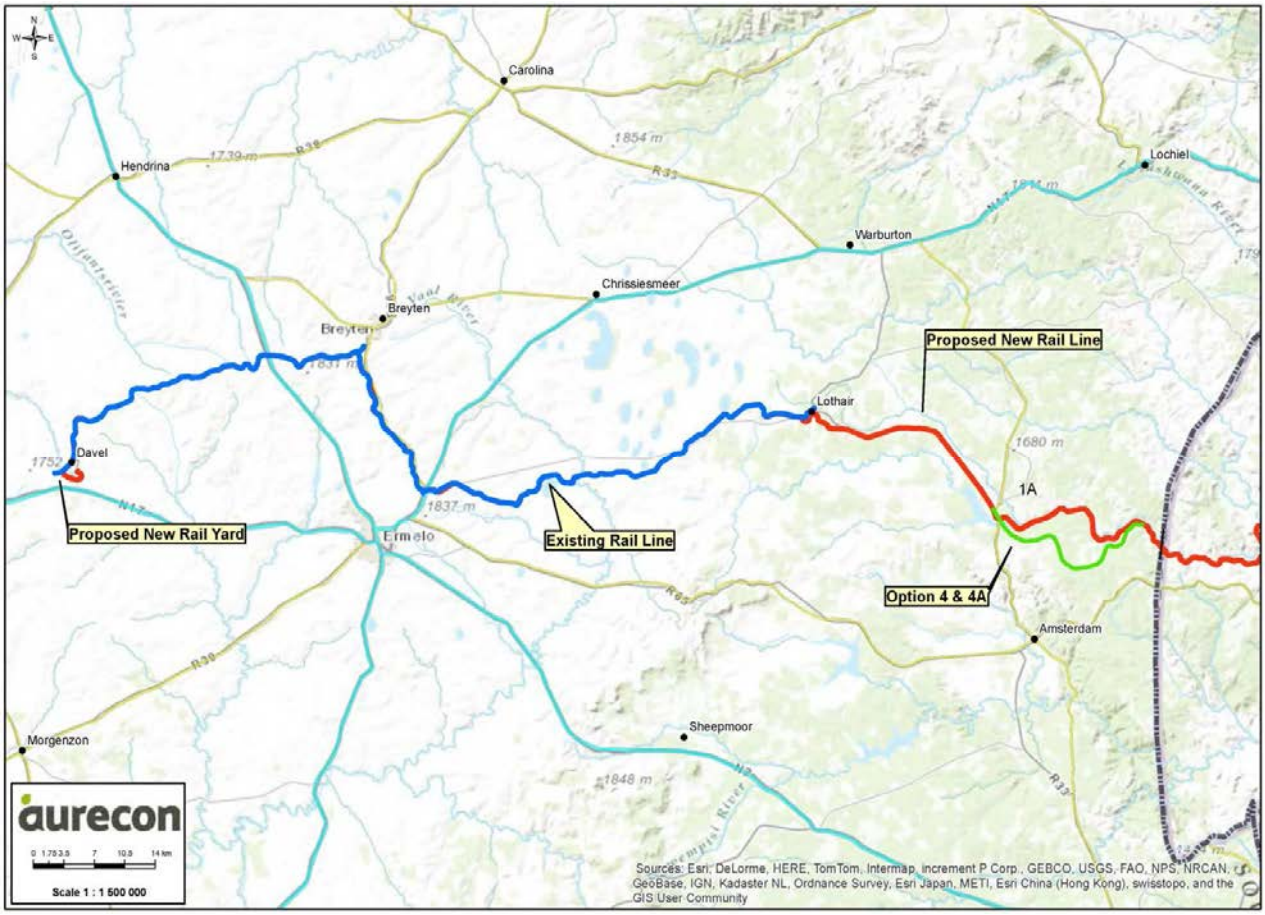

Figure 5: Feasible route alternatives assessed during the EIA phase.

The blue line in Figure 5 indicates the existing railway line which will be upgraded. The red line is the original proposed alignment for the new rail link and the green line indicates the farmers' alternative named alternative 4 and 4a.

1.7 Project Location

The project runs along the existing Transnet railway line from the Davel Yard to Lothair and from there along a new corridor to the Swaziland border as in the options detailed above. The alignment is proposed within the jurisdictional boundaries of the Msukuligwa and Mkhondo municipalities.

2 LEGISLATIVE FRAMEWORK

The management and mitigation of the environmental impacts experienced during construction is governed by environmental legislation. It is of utmost importance that this project is constructed 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 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; and
- 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 EMPR 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 MDEDET 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 4: 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 Davel to the Swaziland border in Mpumalanga

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 5: 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 1000 m 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 50 m^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 80 m^3 but less than 500 m^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 1000 m 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 50 m^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 50 m^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 6: 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 4 m. 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 80 m^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 300 m^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 1 ha 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 of indigenous vegetation with the total area that exceeds 5 ha 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 10 m^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 & 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 10 m^2 or more within a watercourse or within 32 metres of a watercourse.

2.2 Provincial Legislation

The following Mpumalanga provincial legislation will be taken into account during the EIA process:

- Mpumalanga Nature Conservation Act , 10 of 1998; and
- Mpumalanga Tourism and Park Agency Act, 5 of 1998.

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, which will conform to international and national best practise and environmental objectives.

3.2 Assumptions and Limitations

In undertaking this investigation and compiling the EIR 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; and
- All technical and project-related information provided by Transnet is correct and up to date.

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 Davel to the Swaziland Border 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. The MDEDET was also informed of the submitted application.

4 THE PUBLIC PARTICIPATION PROCESS (PPP)

4.1 Introduction

Consultation with the public forms an integral component of the environmental authorisation process. The Public Participation Process 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 by a proposed activity has 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 decisions;
- 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 Public Participation Process 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 two local newspapers 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 Highvelder** (Mpumalanga): 27 June 2013 (English);
- **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 below in Table 7**.**

Table 7: 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 to 23 August 2013**
Notification of Stakeholder and I&AP meetings	**10 to 12 July 2013**
Stakeholder and I&AP meetings	**30 July 2013 to 2 August 2013**
Stakeholder, I&AP and Focus meetings	**August 2013**
Submit Final Scoping Report	**28 August 2013**
Final Scoping Report review period	**28 August 2013 to 1 October 2013**
Submit Final Amended Scoping Report	**10 October 2013**

Activity	Timeframes
Final Amended Scoping Report review period	**11 to 31 October 2013**
DEA approval of Scoping Report	**18 November 2013**
Follow-up Focus Group meetings	**24 January to 10 February 2014**
Draft EIR review period	**7 March to 17 April 2014**
Public and Focus Group Meetings	**25 to 26 March 2014**
Final Environmental Impact Report review period	**16 May 2014 to 11 June 2014**

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. Refer to **Annexure A of Appendix C for a copy of the BID and land owner notification**. 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 additional notification letters is included in **Annexure B of Appendix C. Proof of notification of landowners is also included in this attachment.**

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 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 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 is available have been sent to the Local Municipality as well as to the Davel and Nu Scotland Farmers Associations for their assistance in the provision of contact addresses for these land owners. Proof of these requests is included in **Annexure E of Appendix C**. 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). Every effort has been made to ensure that all affected property owners are informed of the proposal during the EIA Process and are provided with a fair opportunity to submit their comments. Aurecon anticipates that the placement of the legal notices will assist with the identification and participation of landowners. Aurecon also communicated with the Nu Scotland Farmers Association and other landowners to request assistance with the identification of affected landowners.

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 and Telkom who may be affected by the proposed activity;
- Non-government organisations such as the Endangered Wildlife Trust and the Mpumalanga 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.

After the identification and finalisation of additional alternatives 4 and 4a, the newly affected landowners were also identified and notified as per the described notification process.

The I&AP database can be found in **Annexure F of Appendix C**. Note that the identification of affected stakeholders is an on-going process and this list should not be seen as final. Affected stakeholders may register throughout the lifespan of the EIA Process.

4.3.4 Site Notice Boards

In order to notify the surrounding communities and immediate 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 route of the railway alignment. 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. An A4 copy of the Notice boards as well as photos of site notices erected along the route is also included under this attachment.

4.3.5 Issues and Response Trail

Issues, comments and concerns raised during the public participation process are compiled into an Issues and Response Report (refer to **Annexure G of Appendix C**). All comments received up to date have been captured and distributed to members of the project team for further consideration. Refer to **Annexure K of Appendix C** for copies of the comments received. 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 Draft Scoping Report Available for Public Review

The Draft Scoping Report was made available for review and comment by registered I&APs and key stakeholders from 15 July 2013 to 23 August 2013. The Report with Appendices was made available for download from the Aurecon website at www.aurecongroup.co.za as well as on Transnet's website at www.transnet.co.za .

A hard copy of the Report was made available for review by the public at the Ermelo Public Library.

No public facility was available in Lothair which was deemed appropriate (public accessibility and operating hours were insufficient), therefore the Nu Scotland Farmers Association was provided with a hard copy of the Report. Electronic copies of the Report were also distributed at the public meetings which were held in Davel and Lothair.

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

The following organs of state were provided with copies of the Draft Scoping Report:

- Department of Water Affairs;
- MDEDET;
- Provincial Roads Authorities;

- Department Public Works;
- Department Agriculture And Land Administration;
- Gert Sibande District Municipality;
- Affected Municipalities: Msukaligwa and Mkhondo local municipalities;
- Eskom;
- Mpumalanga Tourism and Parks Agency (MTPA);
- South African National Roads Agency Limited (SANRAL);
- South African Heritage Resources Agency (SAHRA); and
- Department of Agriculture, Forestry and Fisheries (DAFF)

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

All comments received during the Scoping Phase of the project have been included in the Issues and Response Report of this final EIR.

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 to 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 Amended Final 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 Final Amended Scoping Report was submitted to DEA on the 10th of October 2013. The report was available during the period of 11 October to 31 October 2013 on the Aurecon and Transnet websites. 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.

The Final Amended Scoping Report and Plan of Study was approved by DEA on 7 November 2013 (refer to **Appendix D**)

4.3.9 Submission of Draft Environmental Impact Report

This draft EIR was made available for review and comment to all I&APs from 7 March 2014 to 17 April 2014. The report was available for download on both the Aurecon website (www.aurecongroup.com) and Transnet website (www.transnet.co.za).

A hard copy of the Report was made available for review by the public at the following venue:

- Ermelo Public Library

No public facility was available in Lothair which was deemed appropriate (public accessibility and operating hours were insufficient). Hard copies of the report were therefore sent to:

- Stafford Ward Councillor
- Community Development Worker in Lothair
- Chairman of Lothair Farmers Association

- Electronic copies of the Report were also distributed at the public meetings which were held in Stafford and Lothair.

The following organs of state were provided with electronic copies of the Draft Environmental Impact Report:

- Department of Water Affairs;
- MDEDET;
- Provincial Roads Authorities;
- Department Public Works;
- Department Agriculture, Rural Development And Land Administration;
- Department of Mineral Resources;
- Gert Sibande District Municipality;
- Affected Municipalities: Msukaligwa and Mkhondo local municipalities;
- Eskom;
- Mpumalanga Tourism and Parks Agency (MTPA);
- South African National Roads Agency Limited (SANRAL);
- South African Heritage Resources Agency (SAHRA); and
- Department of Agriculture, Forestry and Fisheries (DAFF)

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

All comments received during the Scoping Phase of the project have been included in the Issues and Response Report of this final EIR.

4.3.10 Submission of Final Environmental Impact Report

The Final Environmental Impact Report will be submitted to the National Department of Environmental Affairs on the 16 May 2014. Registered I&APs will be afforded an opportunity to review the report during the period of 16 May 2014 to 11 June 2014, and will be requested to submit their comments directly to the DEA as per the requirements of Regulation 56. I&APs will be requested to also submit copies of their comments to Aurecon. The report will be available on the Aurecon and Transnet websites.

4.4 Public Consultation

Public consultation up to date has included the following:

- Public Meeting held at the Davel Primary School on 1 August 2013 from 17:00 to 20:00;
- Focus Group Meeting held with the Nu Scotland Farmers Association [Lothair] on 2 August 2013 at the Nu Scotland Farmers Association Hall from 10:00 to 12:00;
- Public Meeting held with local communities of Lothair, held on 22 August 2013 at the Silindile Community Hall.
- Focus Group Meeting with newly affected landowners for alternatives 4 and 4a between Westoe Dam and Nerston on 24 January 2014 from 09:00 to 11:00
- Focus Group Meeting with the Stafford Community for alternatives 4 and 4a between Westoe Dam and Nerston on 24 January 2014 at 17:00. This meeting was cancelled due to bad weather and rescheduled.

- Focus Group Meeting with the Stafford Community for alternatives 4 and 4a between Westoe Dam and Nerston on 10 February 2014 from 16:30 to 18:30.
- Focus Group Meeting with the Stafford Community to discuss the impacts identified in the Draft Environmental Impact Report on 25 March 2014 from 17:20 to 18:45
- Focus Group Meeting with the Farmers from Lothair to discuss the impacts identified in the Draft Environmental Impact Report on 26 March 2014 from 11:15 to 12:45
- Focus Group Meeting with the Silindile Community to discuss the impacts identified in the Draft Environmental Impact Report on 26 March 2014 from 17:20 to 19:00

Refer to **Annexure M of Appendix C** for copies of the attendance registers for these meetings and **Annexure N of Appendix C** for copies of the presentations which were delivered at the meeting.

The purpose of these 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 these meetings also provided an opportunity for the EAP to explain the EIA Process and to ensure that I&APs understand 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 Issues and Response report which captures the issues and comments provided at the meetings.

During the Scoping Public Meeting held in Lothair with the Nu Scotland Farmers Association on 2 August 2013 the farmers raised concern regarding the route for the new link section for the portion of the alignment stretching from the Westoe Dam up to the Swaziland border. The farmers explained that they had had previous correspondence with Transnet regarding an existing route alternative which they believed would be of a lesser impact on both the farmers as well as the environment.

This new alternative, known by the project as the “farmers’ alternative” was investigated by the project engineers during October 2013 and November 2013. The first layout as proposed was found to be technically unfeasible. Transnet then conducted an investigation on variations on this alternative route which were then deemed technically feasible **(SEE FIGURE 4 IN CHAPTER 1.6.3)**. Following this confirmation a landowner search was undertaken in order to identify the newly affected properties and to obtain contact details for communication with those property owners and occupiers of land.

Public consultation with newly affected landowners for alternatives 4 and 4a:

A meeting with landowners took place on 24 January 2014 in Amsterdam and was attended by approximately 20 people. The agenda included the following:

- A description of the potential new route was presented
- A comparison of the potential environmental impacts of the new alignments were presented

Meeting with community of Stafford

A meeting with the community of Stafford was scheduled to take place on 24 January 2014; the meeting was postponed due to a heavy storm and rescheduled to take place on 10 February 2014 at the Beketelani Primary School. More than 100 people attended the first meeting while approximately 60 attended the second. The agenda included the following:

- A description of the potential new route was presented
- A comparison of the potential environmental impacts of the new alignments were presented

A briefing document was distributed to the newly affected landowners as well as the existing stakeholders registered on the I&AP database. Refer to **Annexure O of Appendix C** for a copy of the briefing document as well as the notification sent.

4.5 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.

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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 6), as illustrated in the two boxes below:

KaNgwane Montane Grassland (Gm 16)

The Eastern Highveld Grasslands is classified as “GM 12” in Mucina and Rutherford (2006). The “GM” refers to the Mesic Highveld Grassland units.

Climate

Early summer rainfall with a MAP of 910 mm. The frequency of frost varies between 3 and 20 days per annum. The area has a cool-temperate pattern with a MAT ranging between 12.6 ºC and 16.7 ºC. Due to the high elevation frost is a common occurrence.

Geology and soils

Mostly on granite of the Mpuluzi Granite (Randian Erathem), Archaean gneiss giving rise to melanic soils, with intrusions of diabase. Land types are Ac, Fa and Ba.

Vegetation and landscape features

Slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual Highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya* etc) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra, Celtis Africana, Diospyros lycioides* subs *lycioides, Parinari capensis, Protea caffra, P. welwitschii* and *Rhus magalismontanum*).

Eastern Temperate Freshwater Wetland (AZf 3)

Freshwater wetlands form a system of archipelagos of small and highly fragmented patches, embedded within all mainland biomes of South Africa. The typical freshwater wetlands are vleis, which form in the catchment areas of Highveld streams (spruits), where a sufficiently shallow gradient permits the soils to remain wet without being eroded by flowing water. Many of the vleis on the Highveld are peat forming, especially where the dominant species is the reed *Phragmites australis*.

The principle threats to wetlands include the conversion of a wetland from one form to another (changing the status of the wetland) and reduction in size, often resulting in the total demise of the wetland habitat. Conversion usually involves the erection of structures within the wetland, typically dams. Impounding causes changes in the functioning of the wetland by reducing the flow of water downstream while increasing the inundation period and/or depth of inundation. Excessive water pollution results in shifts from oligotrophic (usually very diverse habitats of high conservation value) to eutrophic wetlands, often dominated by single ubiquitous species choked by algal blooms.

Drainage of a wetland involves both diversion of water away from the wetland, as well as the extraction of water from the wetland itself via drains. This results in changes in the species composition from wetland species to a habitat dominated by purely terrestrial species, as well as changes in the soils from typically anaerobic to aerobic.

The main pollution threats to wetlands are petrochemical spills, unprocessed or semi processed sewage, fertiliser and pesticide runoff, and dumping, both of garbage and rubble.

The Eastern Temperate Freshwater Wetlands is classified as “AZf 3” in Mucina and Rutherford (2006). The “AZf” refers to the Azonal Freshwater vegetation units

Climate

Exclusively summer-rainfall region with a mean annual precipitation (MAP) range of 421 – 915 mm. Cool-temperate pattern with mean annual temperature (MAT) ranging between 12.6 ºC and 16.7 ºC. Due to high elevation, frost is a frequent phenomenon.

Geology and soils

Found on younger Pleistocene to recent sediments overlying fine-grained sedimentary rocks of the Karoo Supergroup (on sediments of both Ecca and Beaufort Groups due to the large extent of the area of occurrence) as well as of the much older dolomites of the Malmani Subgroup of the Transvaal Supergroup in the northwest. Especially the areas built by Karoo Supergroup sediments are associated with the occurrence of Jurassic Karoo dolerite dykes having a profound influence on run-off. Soils are peaty (Champagne soil form) to vertic (Rensberg soil form). The vleis form where flow of water is impeded by impermeable soils and/or by erosion resistant features such as dolerite intrusions. Many vleis and pans of this type of freshwater wetlands are inundated and/or saturated only during the summer rainfall season, and form some months after this into the middle of the dry winter season, but they may remain saturated all year round. Surface water inundation may be present at any point while the wetland is saturated and some plant species will be present only under inundated conditions, or under permanently saturated conditions, or under permanently saturated conditions. The presence of standing water should not be taken as a sign of permanent wet conditions.

Vegetation and landscape features

Largely comprised of undulating hills and plains that occur on the eastern edge of the Escarpment. This unit is transitional between the Highveld and Escarpment and contains elements of both. The vegetation structure is comprised of a short closed grassland layer with many forbs, and a few scattered shrubs on the rocky outcrops.

Soweto Highveld Grassland (Gm 8)

The term “grassland” refers to herbaceous vegetation of relatively short and simple structure that is dominated by graminoids, usually of the family Poaceae. Woody plants are rare (usually low or medium-sized shrubs) or absent or are confined to specific habitats, such as smaller escarpments or koppies, Core grassland areas usually have deep, fertile soils although a wide spectrum of soil types occurs.
The Soweto Highveld Grassland is classified as “GM 8” in Mucina and Rutherford (2006). The “GM” refers to the Mesic Highveld Grassland units.

Climate

The cold, dry conditions of the Highveld region are the result of the high elevation and inland continental aspect of these areas. These aspects are important in defining the current climate of these areas. The temperate grasslands of southern Africa occur where there is summer to strong summer rainfall and winter drought. Frost is a common occurrence; the coldest periods (June – August) are exacerbated by aridity or along an increasing elevation gradient.

The Soweto Highveld Grassland region is a summer rainfall area with a mean annual rainfall (MAR) of 662 mm and cool-temperate climate with high extremes between maximum summer and minimum winter temperatures, with frequent occurrence of frost (mean number of frost days 41) and large thermal diurnal differences especially in autumn and spring.

Geology and soils

Shale, sandstone or mudstone of the Madzaringwe Formation (Karoo Supergoup) or the intrusive Karoo Suite dolerites which feature prominently in the area. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types.

Vegetation and landscape features

Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus, Eragrostis racemosa, Heteropogon contortus and Tristachya leucothrix*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.

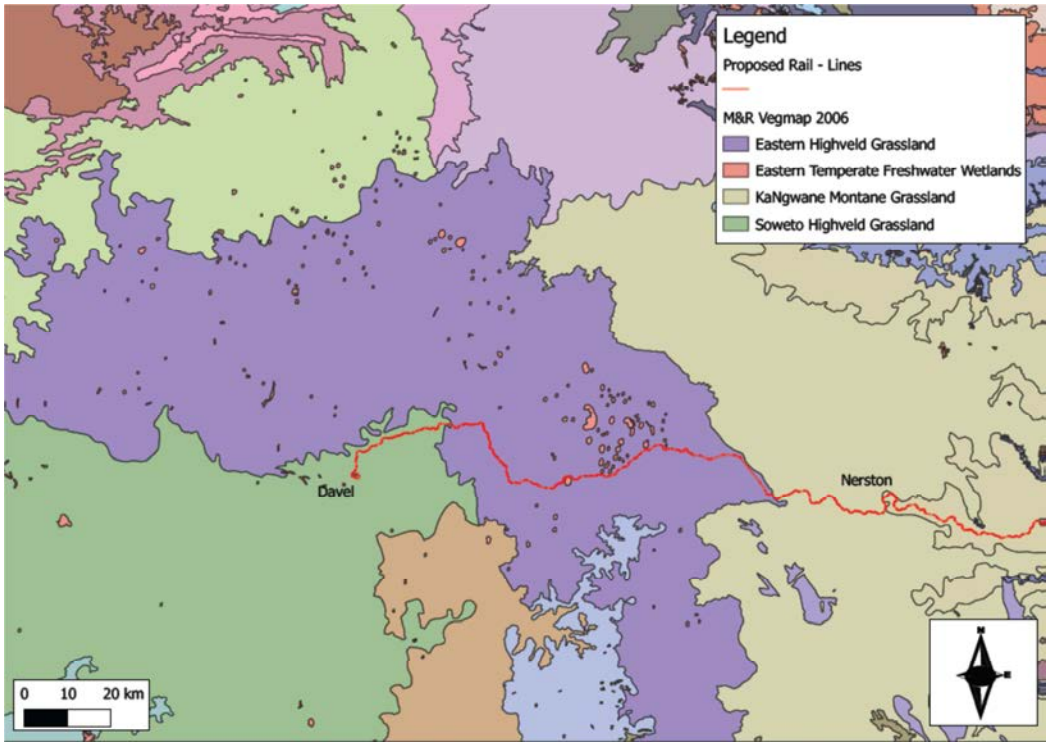

Figure 6: The Davel to Nerston line in relation to the regional vegetation types as defined by Mucina & Rutherford (2006)

5.1.2 Noise and Vibration

The project runs through areas with low numbers of inhabitants such as farmlands and forestry plantations. A number of communities are however affected by the current alignment as well as the proposed new alignment.

The N11, N17 and R33 routes are proposed to be crossed by the new rail link section between Lothair and the Nerston border as well as the upgrade of the existing line from Davel to Lothair.

Ground conditions may vary depending on the section of rail under investigation (rural or urban). It is assumed that ground conditions could be classified as medium in terms of acoustics (i.e. slightly acoustically absorbent). This specifically relates to the way that the ground surface influences the propagation of the sound from the development as the fraction of sound that is reflected from the ground would be influenced as certain frequencies would be absorbed by the ground surface. Ground conditions will be further investigated during the Environmental Noise Impact Assessment (ENIA) phase.

Besides the mentioned roads there could be a few other significant contributors of noise in the study area of an industrial nature. Other major ambient noise contributors will be identified and quantified during the ENIA phase. Based on the desktop study conducted by Enviro-Acoustic Research, ambient sound levels could range from rural to urban in acoustical character depending on the section of rail route under investigation. Measurements conducted during the ENIA phase would ambient sound levels more accurately.

Potentially sensitive receptors (also known as noise-sensitive developments or NSDs) at a distance of approximately 450 m along the Davel to Nerston rail route were identified using Google Earth®. These receptors are illustrated in Figure 7. The status of these dwellings (derelict, residential etc.) may be confirmed during the ENIA phase.

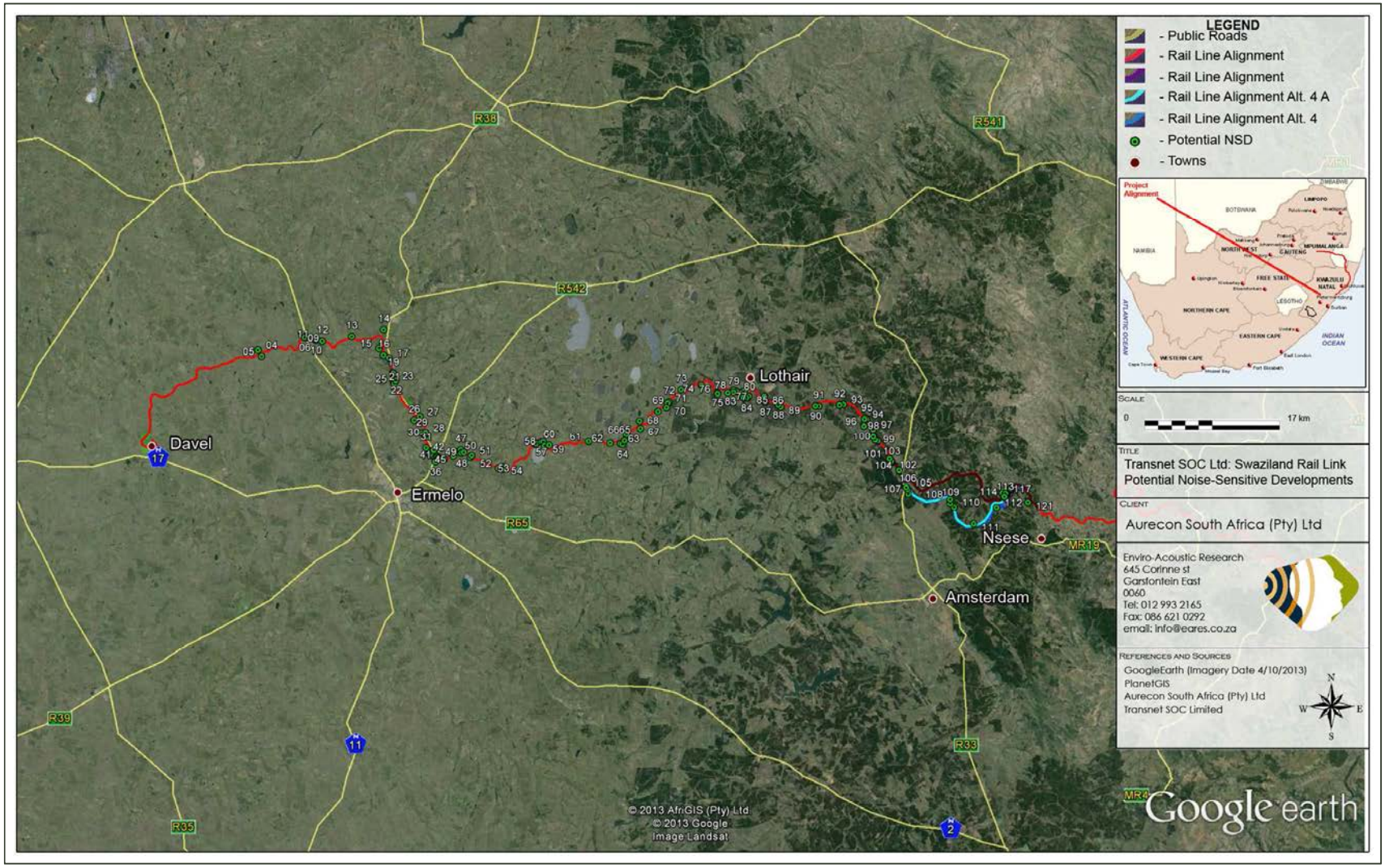

Figure 7: Noise sensitive receptors for the receiving environment

5.2 Biophysical Environment

The present day land use around the route is characterised by rural urban development, rural informal development, subsistence agriculture (cattle), large scale commercial crop production, commercial forestry and areas containing waterbodies such as rivers, wetlands and endorheic pans (depressions) (Figure 8).

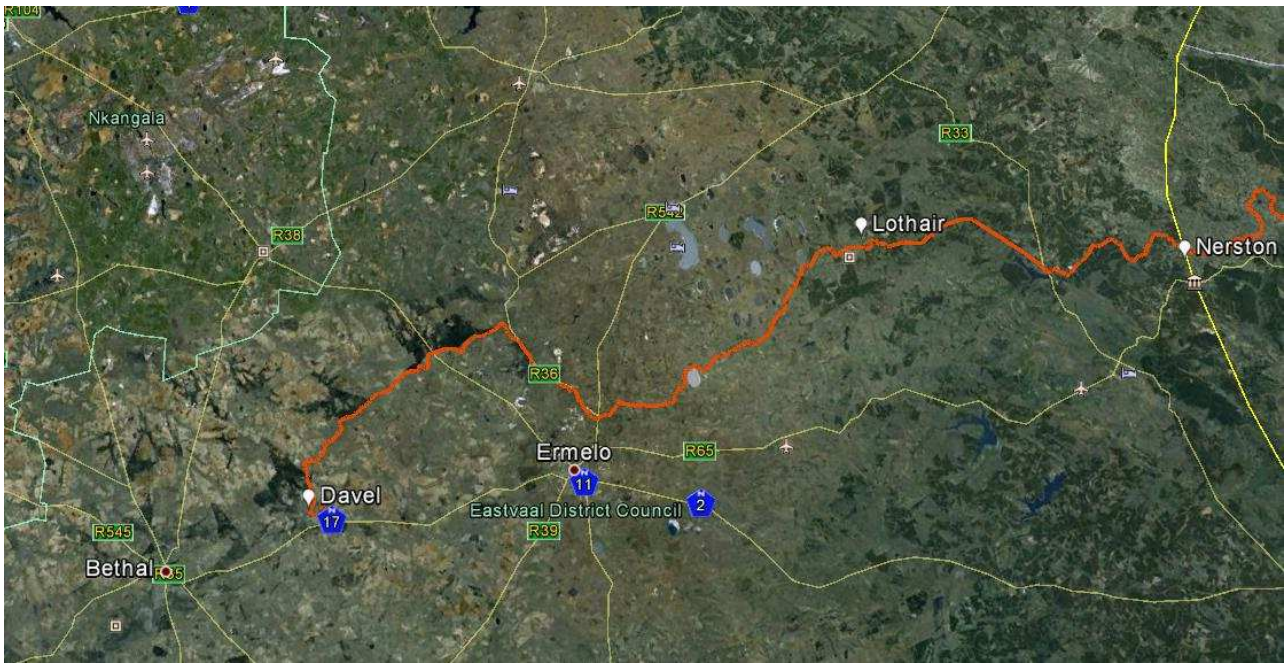

Figure 8: The Davel to Nerston line (orange)

The study area is dominated by a mixture of urban and rural housing, forestry and agriculture, with the associated infrastructure such as roads, dams and the present rail network.

5.2.1 Aquatic environment

The Davel to Nerston line for the most part falls along the Upper Vaal and Olifants rivers catchment divide and both of these catchments contain numerous small streams / rivers and the endorheic pans (Figure 9). The existing railway line and the proposed new alignment cross a total of eighty one (81) non-perennial and seven (7) perennial watercourses. All of these systems have been classified as part of the National Freshwater Ecosystem Priority Atlas (NFEPA) project (Nel *et al*., 2011).

The majority of the wetlands within the study area have been shown to be natural, and form part of the important Highveld Grassland Wetland Cluster. However some of these would be considered modified and thus has a conservation rating score of Z1 or Z2, i.e. low conservation importance. The remaining natural wetland areas associated with the local streams and pans were mostly rated as A/B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al*., 2011).

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.

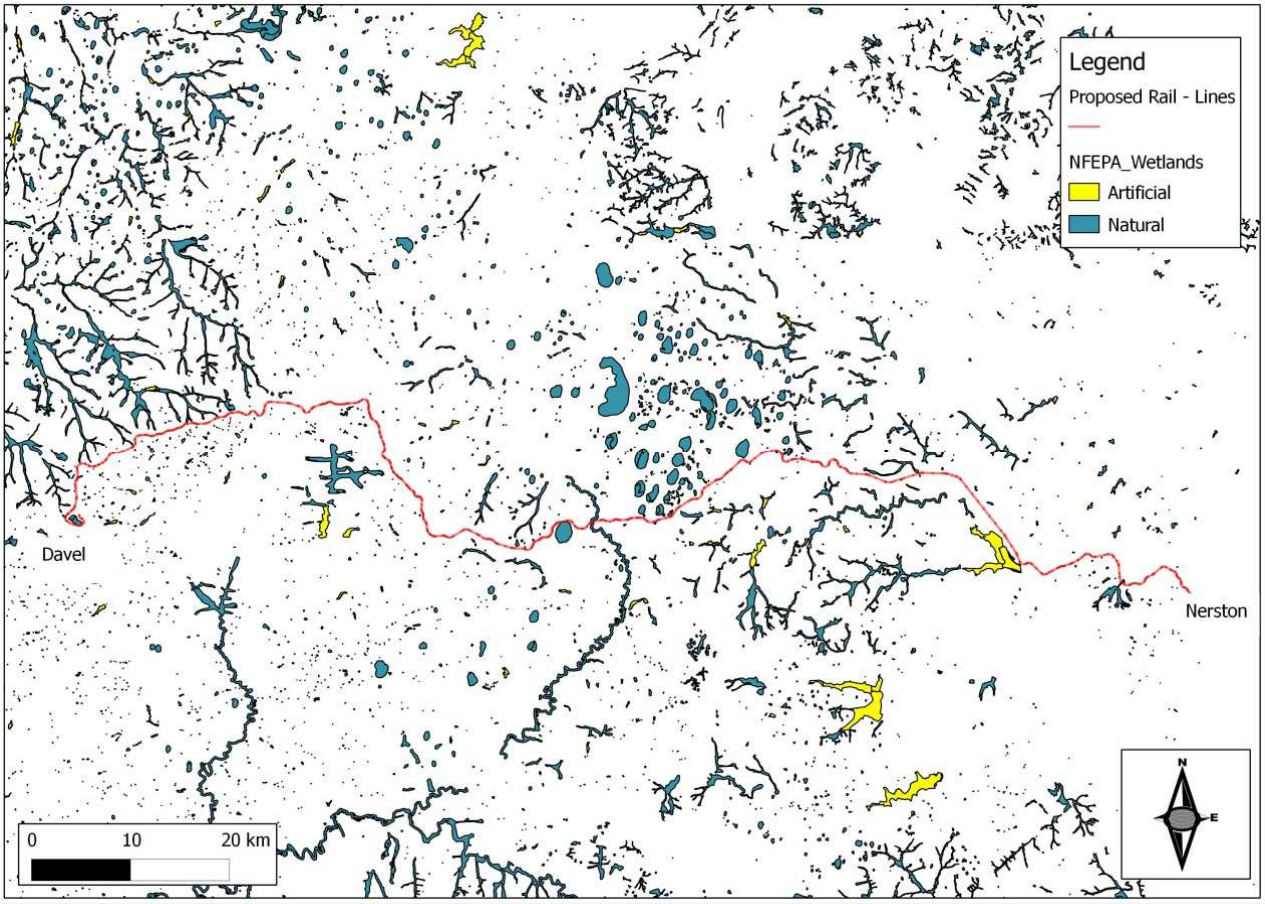

Figure 9: A map illustrating the major rivers and wetlands areas within the study region

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 (Ferrar & Lötter, 2007). This produced a conservation map of the province (Figure 10). This was also conducted for the aquatic environment, although most of the data used has now been used in the NFEPA assessment.

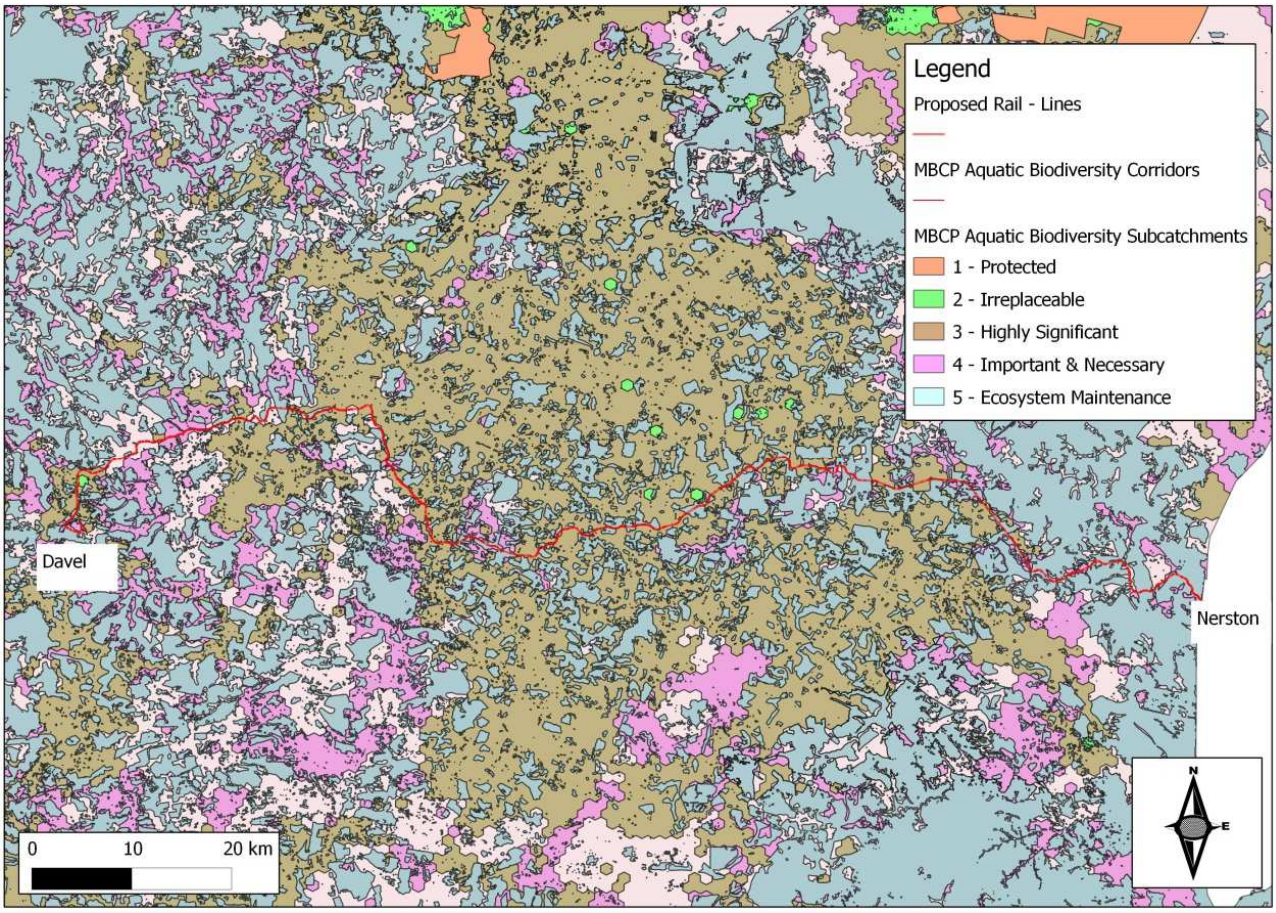

Figure 10: A map illustrating the results of the Mpumalanga Biodiversity Conservation Plan results for the Terrestrial environment (Ferrar & Lötter, 2007)

It is also important to note that this information was also used in determining the status of the NEM:BA Threatened Ecosystems discussed above for the province.

The Davel - Nerston line will traverse a number of important habitats, which are shown in Figure 10 as either:

- Irreplaceable - development criteria = “linear developments are restricted”
- Highly significant – development criteria = “linear developments are restricted”
- Important or necessary (ecosystem functioning or corridors) - development criteria = “linear developments are restricted”

The remaining areas were categorised as follows:

- No Natural habitat remaining - development criteria = “linear developments are permitted”
- Least concern - development criteria = “linear developments are permitted”

Figure 11 indicates that a portion of the line falls within two Highly Significant catchments. This is possibly due to this catchment forming part of the catchment divide between the Vaal River and the Olifants. Most of these rivers are categorised with a 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 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).

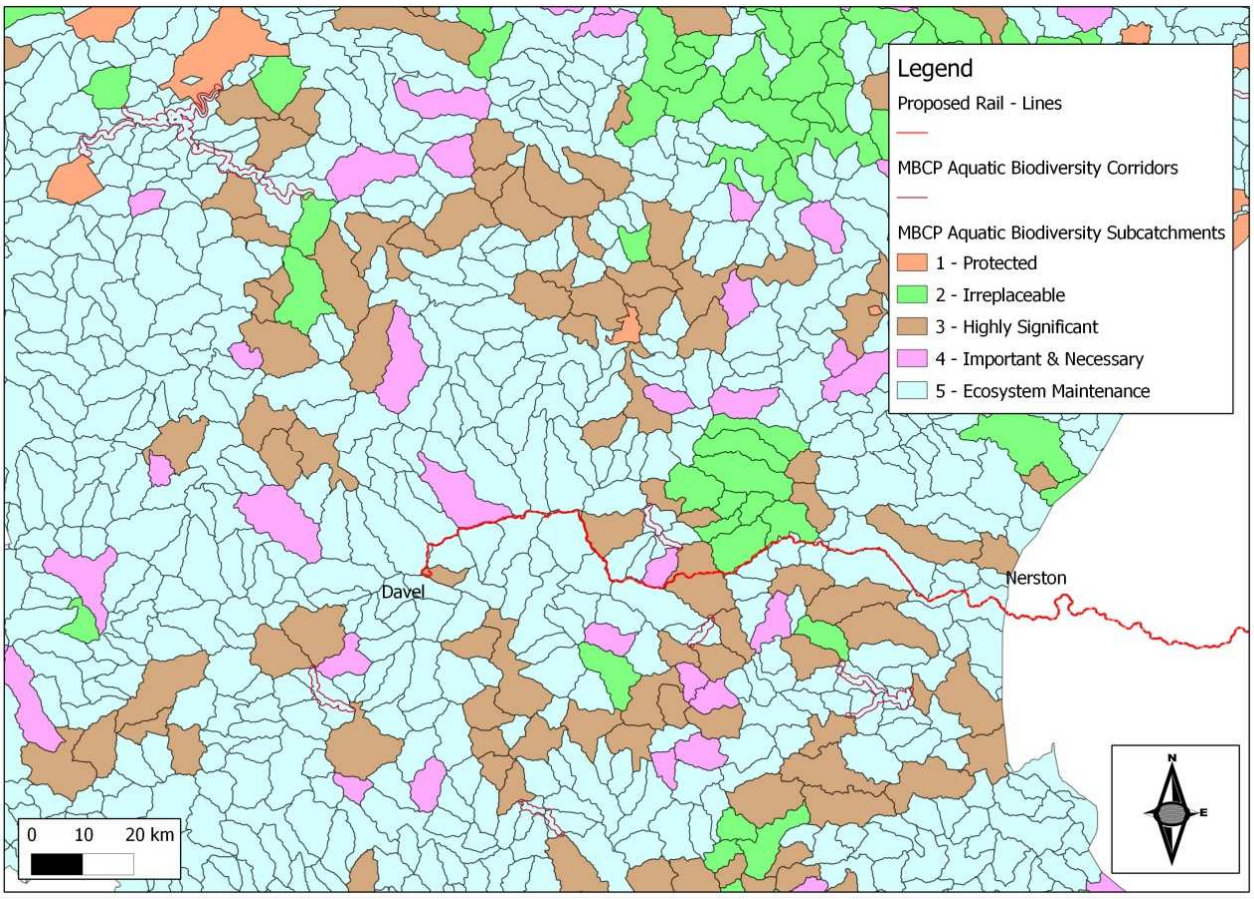

Figure 11: A map illustrating the results of the Mpumalanga Biodiversity Conservation Plan results for the aquatic environment (Ferrar & Lötter, 2007). The map indicates the aquatic biodiversity subcatchments.

5.2.2 Fauna

In a desktop assessment of various taxonomic databases approximately 70 known fish and invertebrate species are expected to occur within the region, while mammals and herpetofauna (snakes and frogs) possibly contribute another 10 – 20 species. The expected bird species within the study area is expected to be around 50 – 190 species depending on the type of available habitat within the study area.

Although the likelihood of these species occurring is low due to the presence of the railway and associated infrastructure, the following species, amongst others will be searched for:

Table 8: Red data species which might be present on site

Species	Red Data Status	Preferred Habitat
Birds		
Anthropoides paradiseus **(Blue Crane)**	Vulnerable	Prefers open pristine grasslands, as well as wetland habitats.
Circus macrourus **(Pallid Harrier)**	Near-threatened	Considered a vagrant to South Africa.
Circus ranivorus **(African Marsh Harrier)**	Vulnerable	Restricted to permanent wetlands with extensive reedbeds.
Circus maurus **(Black Harrier)**	Near-threatened	Generally confined to the clay grassland of the southern part of Mpumalanga
Eupodotis senegalensis **(White-bellied Korhaan)**	Vulnerable	Prefers transitional habitat between grassland and savanna.
Eupodotis caerulescens **(Blue Korhaan)**	Near-threatened	Prefers extensive open short grassland and cultivated land.
Falco naumanni **(Lesser Kestrel)**	Vulnerable	The open grassland patches provide foraging habitat.
Geronticus calvus **(Southern Bald Ibis)**	Vulnerable	A species restricted to montane grassland (especially when burned) and breed/nest on steep cliffs.
Glareola nordmanni **(Black-winged Pratincole)**	Near-threatened	A species of extensive open grassland, usually near wetlands. Often forages over agricultural fields.
Mycteria ibis **(Yellow-billed Stork)**	Near-threatened	Prefers shoreline habitat bordering large impoundments and extensive wetland systems.
Phoenicopterus minor **(Lesser Flamingo)**	Near-threatened	Restricted to large alkaline pans and other inland water bodies.
Phoenicopterus ruber **(Greater Flamingo)**	Near-threatened	Restricted to large saline pans and other inland water bodies.
Sagittarius serpentarius **(Secretary bird)**	Near-threatened	Prefers open grassland or lightly wooded habitat.
Tyto capensis **(African Grass Owl)**	Vulnerable	Prefers rank moist grassland that borders drainage lines or wetlands.
Invertebrates		
Metisella meninx **(Marsh Slyph) - butterfly**	Vulnerable	Wetland grasslands containing *Leersia hexandra*
Herpetofauna		
Acontias g. gracilicauda	Rare	Burrows underground

5.2.3 Flora

The National Environmental Management: Biodiversity Act, 10 of 2004, lists 225 threatened ecosystems based on vegetation type (Vegmap). All four vegetation types (section 5.1.1) present along the rail alignment are listed by this Act as Vulnerable. Therefore as a minimum, the Act stipulates that a Basic Assessment must be conducted when an activity is proposed within these ecosystems.

Present maps only indicate the original extent of these ecosystems; therefore the assessment of these ecosystems, their current extent and status formed a major focus of the EIA field visit, especially since 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 project runs through the Gert Sibande District which comprises the following Local Municipalities (see Figure 12):

- Msukaligwa Local Municipality;
- Albert Luthuli Local Municipality; and
- Mkhondo Local Municipality.

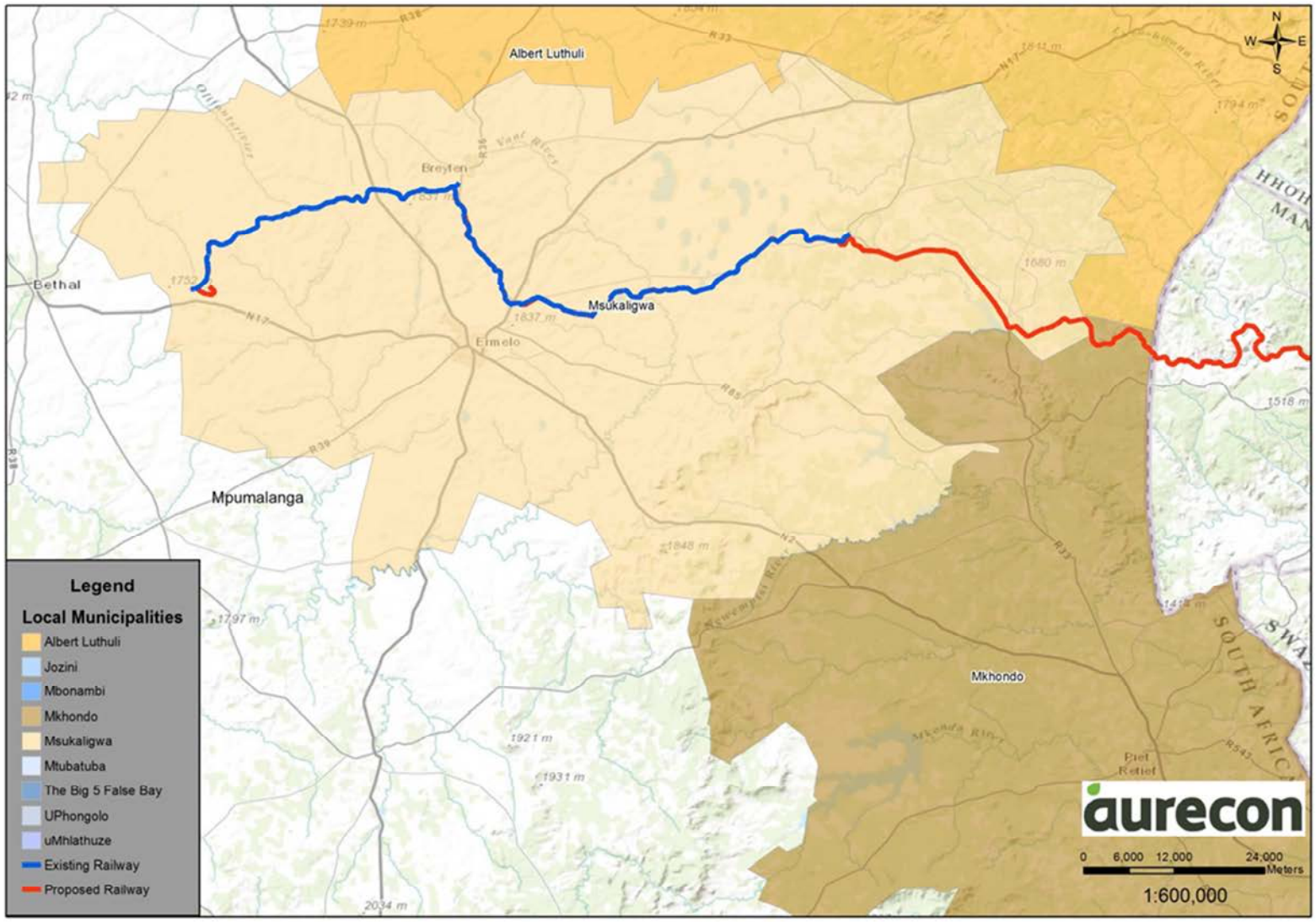

Figure 12: Affected local municipalities in the Mpumalanga Province

5.3.1 Social environment

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 following local municipalities are described in this section:

- Albert Luthuli Local Municipality
- Msukaligwa Local Municipality
- Mkhondo Local Municipality.

Albert Luthuli Local Municipality

Albert Luthuli Local Municipality is located in the Gert Sibande District Municipality with an area of 5,559 km^2. Carolina is the Seat of the municipality. The Municipal area of jurisdiction stretches roughly from Syde to Ekulindeni (Crysbestos) along the Swaziland and South African border in the east, towards Hendrina to the west and then roughly from Nooitgedaght and Vygeboom Dams in the north to Warburton in the south.

The area is transversed by three prominent east west and north-south provincial routes, namely the R38, R36 and R33. All three provincial routes play a tremendous role in serving as transport and economic linkages linking all areas not only within the Albert Luthuli Local Municipal area but also with other important areas in the Nkangala, Ehlanzeni and Gert Sibande regions. Table 9 below provides a summary of the population characteristics in the municipality.

Table 9: Albert Luthuli Local Municipality

Population Characteristics	
Male	87 188
Female	98 822
Total	186 010
Households	47 705
Average Household Size	3.80
Female Headed Households	49.30%
Formal Dwellings	76.50%
Population Age Distribution (%)	**Percentage of Total Population**
0-15	36.50%
15-64	58.20%

65+	5.30%
Population density (p/km^2)	3,39 p/km^2
Population growth (%)	-0.09% p.a.
Unemployment rate	35.40%
Youth unemployment rate	45.10%
Household services	**Percentage**
Flush toilet connected to sewerage	18.90%
Weekly Refuse Removal	19.30%
Piped Water Inside Dwelling	22.60%
Electricity For Lighting	87.50%

Source: Census 2011 Municipal Fact Sheet, published by Statistics South Africa

5.3.1.1 Msukaligwa Local Municipality

Msukaligwa Local Municipality is situated in the Gert Sibande District Municipality with Ermelo as the Seat of the municipality. The municipality has an area of 6,016 km^2. Table 10 below provides the demographic characteristics of the population in the municipality.

Table 10: Msukaligwa Local Municipality

Population Characteristics	
Male	74 113
Female	75 264
Total	149 377
Households	40 932
Average Household Size	3,5
Female Headed Households	37,8%
Formal Dwellings	30 827
Population Age Distribution (%)	**Total number**
0-15	40.46%
15-64	55.45%

65+	4.06%
Population density (p/km^2)	24.8 p/km2
Population growth (%)	1.80% p.a.
Unemployment rate	36.20%
Youth unemployment rate	34.50%
Household services	**Percentage**
Flush toilet connected to sewerage	73.64%
Weekly Refuse Removal	66.93%
Piped Water Inside Dwelling	78.17%
Electricity For Lighting	74.66%

Source: Census 2011 Municipal Fact Sheet, published by Statistics South Africa

5.3.1.2 Mkhondo Local Municipality

Mkhondo Local Municipality is situated in Gert Sibande District Municipality with Piet Retief as the Seat of the municipality and has an area of 4,882 km2. Table 11 below provides the demographic characteristics of the population in the municipality.

Table 11: Mkhondo Local Municipality

Population Characteristics	
Male	82 263
Female	89 719
Total	171 984
Households	37 433
Average Household Size	4.5
Female Headed Households	45.30%
Formal Dwellings	24399
Population Age Distribution	**Percentage of Total Population**
0-15	12.67%
15-64	22.65%

65+	4%
Population density (p/km^2)	3,39 p/km2
Population growth (%)	-5% p.a
Unemployment rate	43%
Youth unemployment rate	44.60%
Household services	**Percentage**
Flush toilet connected to sewerage	43%
Weekly Refuse Removal	42%
Piped Water Inside Dwelling	67%
Electricity For Lighting	69%

Source: Census 2011 Municipal Fact Sheet, published by Statistics South Africa

5.3.2 Socio-economic environment

Labour and economic analysis

In the analysis of the labour and employment situation in municipal areas, 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 trans frontier 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.

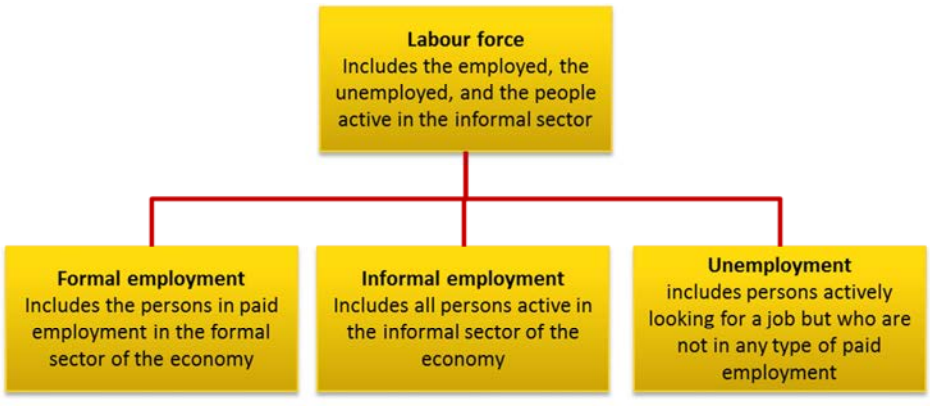

Figure 13: Composition of the labour force

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. Figure 13 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.

Description of the labour force

Table 12 describes the labour force of the three LMs that will be directly affected by the proposed rail line. According to the 2011 data acquired from the Quantec database, the three municipalities have 135 895, 91 854, and 79 314 economically active persons in the Albert Luthuli, Msukaligwa, and Mkhondo Local Municipalities respectively. From the data it can be seen that the majority of the population in the first two municipalities are employed, with the majority of the employment in the formal sector. In the Mkhondo Local Municipality the unemployment rate is however almost 50%. In all three the municipalities the formal employment rate is higher than the informal employment rate. The unemployment rate of the three municipalities varies between 20% and 48% and the labour force participation rate between 45% and 57%.

The size of the informal sector, which includes subsistence agriculture that is highly applicable in the concerned 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.

Table 12: Mpumalanga LM labour force (2011)

	Albert Luthuli Local Municipality	Msukaligwa Local Municipality	Mkhondo Local Municipality
Description	**Number**	**Number**	**Number**
Population	196,412	126,687	110,575
Economically active	135,895	91,854	79,314
Formal and informal (Total)	30,650	36,971	17,857
Formal	22,642	26,104	13,385
Formal - Highly skilled	4,423	4,402	1,556
Formal - Skilled	9,841	10,739	4,509
Formal - Semi- and unskilled	8,378	10,963	7,320
Informal	8,008	10,867	4,471
Unemployed	19,797	9,707	16,202
Unemployment rate (%)	39.24	20.80	47.57

Labour force participation rate (%)	45.46	57.27	52.14

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.

Employment productivity

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

The table below shows the employment per sector for each of the affected local municipalities. The structure of employment and the extent of the link between employment and the level of economic activity are important.

Table 13: Employment per sector (Mpumalanga LM)

		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
Albert Luthuli LM	1995	11,466	2,108	1,604	96	1,548	3,435	739	795	2,473	3,988	28,251
	2001	8,949	752	1,836	130	1,436	4,655	588	1,226	3,034	4,210	26,815
	2005	6,033	748	1,992	115	1,433	6,431	752	1,964	3,461	4,884	27,813
	2011	2,720	1,398	1,379	141	1,222	9,403	884	3,063	3,884	6,554	30,650
	Avg. Change	**-4.5%**	**-2.0%**	**-0.8%**	**2.8%**	**-1.2%**	**10.2%**	**1.2%**	**16.8%**	**3.4%**	**3.8%**	**0.5%**
Msukaligwa LM	1995	14,225	2,929	2,669	244	2,478	6,074	1,543	2,131	3,504	3,318	39,114
	2001	10,568	1,970	2,685	199	1,349	7,355	1,224	2,397	4,134	3,468	35,350
	2005	7,909	1,511	2,681	262	1,572	9,255	1,667	2,553	4,651	4,073	36,134
	2011	3,950	1,689	1,610	654	1,701	11,931	2,133	2,518	5,293	5,494	36,971
	Avg. Change	**-4.2%**	**-2.5%**	**-2.3%**	**9.9%**	**-1.8%**	**5.7%**	**2.2%**	**1.1%**	**3.0%**	**3.9%**	**-0.3%**
Mkhondo LM	1995	16,992	706	4,395	75	1,350	3,876	645	743	1,897	1,448	32,128
	2001	12,378	677	3,878	70	1,042	5,421	500	1,086	2,744	1,859	29,655
	2005	9,225	1,267	2,058	50	1,039	4,922	715	1,298	2,234	1,581	24,389
	2011	3,958	3,454	375	60	911	4,068	970	1,282	1,588	1,190	17,857
	Avg. Change	**-4.5%**	**22.9%**	**-5.4%**	**-1.2%**	**-1.9%**	**0.3%**	**3.0%**	**4.3%**	**-1.0%**	**-1.0%**	**-2.6%**

The overall employment figures for the three municipalities remained relatively constant over the 16 year period from 1995 to 2011. There are however a few aspects that need to be discussed.

The most noticeable is the differential growth rates in employment creation between the sectors. In all three of the municipalities there has been a decrease in employment in the Agriculture sector. The implication is important

since these workers are jobless and have to leave farms. They usually end up in informal settlements on the urban periphery.

In the Albert Luthuli LM there has been a significant increase in the secondary and tertiary employment sectors, especially in trade in business services. The high increase in these sectors possibly contributed to the overall growth in employment for this municipality.

The Msukaligwa LM has seen a large decrease in overall primary sector employment. All of the other employment sectors have however indicated an overall growth and it is assumed that most of the people who lost their jobs in the primary sector got employed in the secondary and tertiary sector, which showed strong increases, with the exception of the construction industry. There is however a slight decrease in overall employment.

The Mkhondo LM shows a high increase in employment in the mining and quarrying sector. There has however been a decrease in the overall employment of the LM. Overall the primary and secondary sectors are both shedding jobs while the tertiary sector is growing strongly.

Table 14 shows the employment distribution per sector. These figures are expressed in terms of the distribution of employment across the sectors. The moat noticeable aspect is that the largest economic sectors are not necessarily the biggest contributors to employment creation.

Table 14: 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
Albert Luthuli LM	8.9%	4.6%	4.5%	0.5%	4.0%	30.7%	2.9%	10.0%	12.7%	21.4%	100.0 %
Msukaligwa LM	10.7 %	4.6%	4.4%	1.8%	4.6%	32.3%	5.8%	6.8%	14.3%	14.9%	100.0 %
Mkhondo LM	22.2 %	19.3%	2.1%	0.3%	5.1%	22.8%	5.4%	7.2%	8.9%	6.7%	100.0 %

Changes in employment

Employment is not a static issue and changes in employment are very important, and can shed light on the development of the municipalities over the past few years. The tables below give a comparison between the employment situation in 1995 and in 2011 for each of the local municipalities under consideration.

Albert Luthuli Local Municipality:

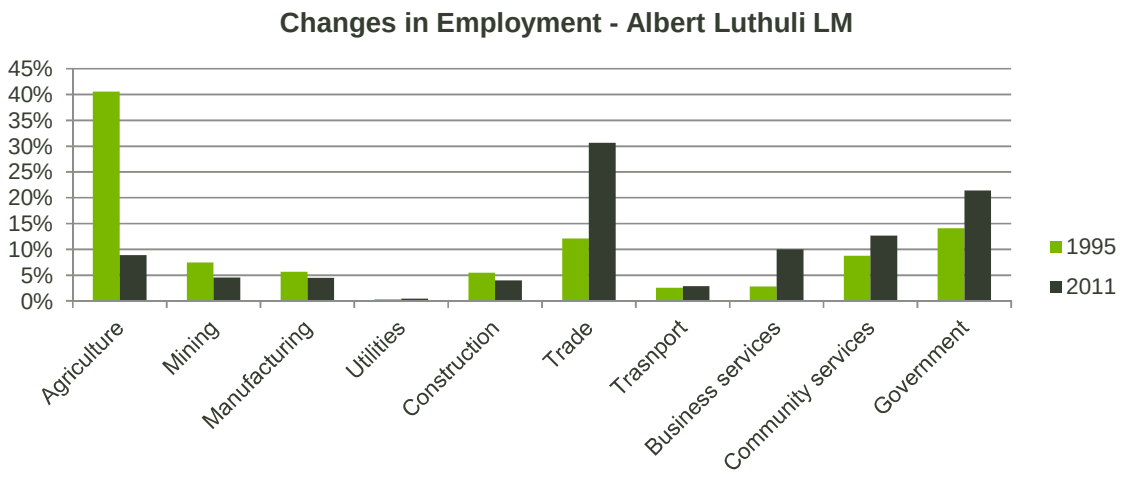

Figure 14: Comparative employment situation in 1995 and 2011 (Employment per sector) – Albert Luthuli LM

Figure 14 shows an overall decrease in primary sector employment, with the most significant decrease in the agricultural sector. There is however a clear increase in secondary and tertiary sector employment.

Figure 15 clearly indicates a decline in primary and secondary employment, but also indicates a significant increase in employment in the tertiary sector.

Msukaligwa Local Municipality:

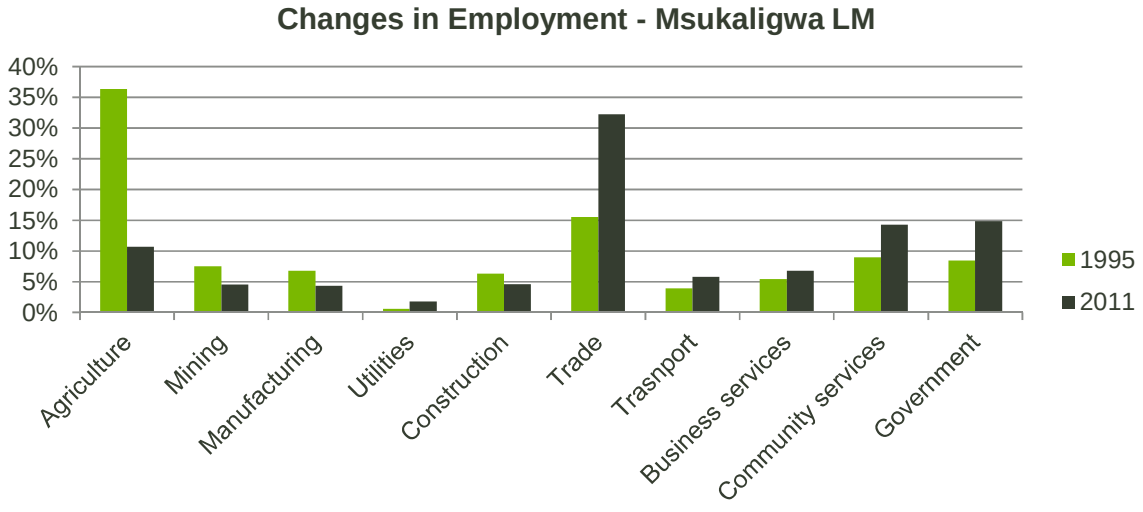

Figure 15: Comparative employment situation in 1995 and 2011 (Employment per sector) – Msukaligwa LM

Mkhondo Local Municipality:

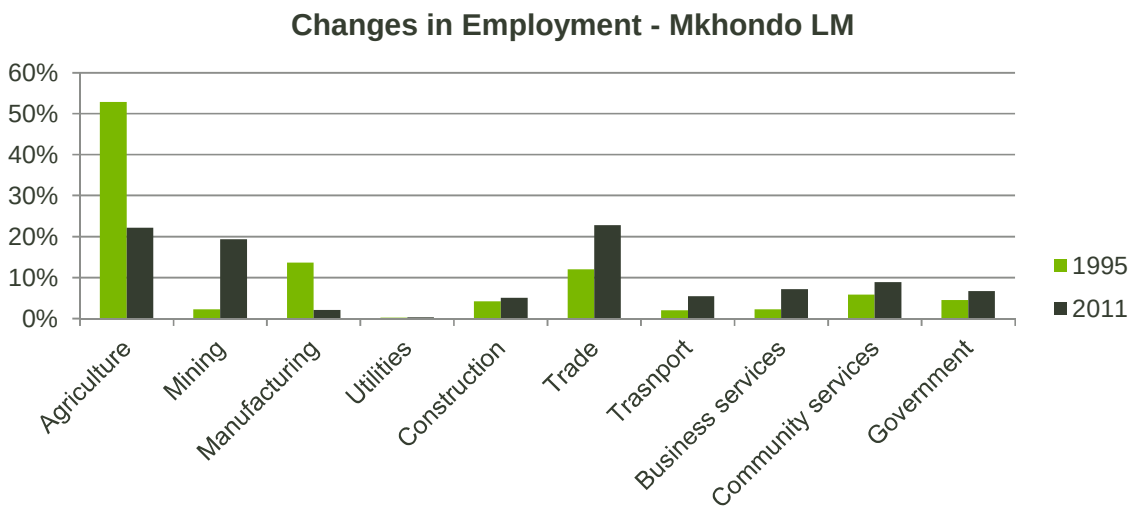

Figure 16: Comparative employment situation in 1995 and 2011 (Employment per sector) – Mkhondo LM

Figure 16 shows a high decrease in agriculture, which has also been identified in the other two local municipalities in the study area. In contrast to the other two municipalities, there is a high increase in mining employment. Similar to the other two municipalities, the increase in the secondary and tertiary employment sectors is noted.

It is not possible to draw any specific conclusion regarding labour productivity. The interplay between labour and capital is not assessed. The Albert Luthuli and Msukaligwa LMs indicate a decrease in GVA output for the primary sector, but an increase for the secondary and tertiary sectors. This confirms the trends that were identified in the comparative employment figures. The Mkhondo LM in contrast indicated a growth in GVA output for the primary sector, and a decrease in the secondary sector. 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.

Migrant labour

To calculate both the size of the migrant labour force and the spatial distribution of their areas of origin, male absenteeism ratios are utilised. In the process, it is firstly assumed that only males in the 15 to 64 year age group will migrate, meaning work on a contract basis in another area and return home at least once a year on average. This assumption is patently invalid as substantial numbers of females also migrate, but it is the only plausible way of establishing a minimum level of male migrant workers. Indications are that migrant labour does not play a role in the studied LMs. The Male to Female ratio is almost a 50/50 split.

Economic structure and performance

The table below shows the Gross Value Added (GVA) output per labour unit. GVA is an economic measure of the value of goods and services that are produced in an area.

Table 15: GVA output per labour unit (R'million)

	Albert Luthuli Local Municipality			Msukaligwa Local Municipality			Mkhondo Local Municipality		
	Primary Sector	Secondary Sector	Tertiary Sector	Primary Sector	Secondary Sector	Tertiary Sector	Primary Sector	Secondary Sector	Tertiary Sector
1995	719	203	1,001	969	373	1,531	372	506	726
1996	682	223	1,049	982	390	1,601	451	534	784
1997	615	250	1,065	975	408	1,614	442	574	813
1998	519	256	1,088	946	388	1,626	441	559	837
1999	498	262	1,129	969	370	1,670	496	536	881
2000	460	279	1,159	952	382	1,675	540	540	898
2001	395	286	1,192	885	395	1,708	493	523	918
2002	390	334	1,241	861	447	1,743	536	531	916
2003	399	327	1,325	831	448	1,835	605	441	917
2004	404	348	1,411	788	496	1,944	676	397	913
2005	415	369	1,522	716	552	2,063	759	359	909
2006	373	394	1,647	647	614	2,222	771	317	913
2007	367	420	1,784	617	685	2,355	857	282	930
2008	377	444	1,888	607	735	2,465	984	242	918
2009	359	462	1,958	563	784	2,483	1,023	195	887
2010	395	509	1,994	574	787	2,499	1,058	180	880
2011	386	516	2,077	560	802	2,583	1,097	176	890
% Growth Per annum	**-2.72%**	**9.04%**	**6.32%**	**-2.48%**	**6.78%**	**4.04%**	**11.48%**	**-3.84%**	**1.33%**

The table is structured according to primary, secondary, and tertiary sector that is grouped as follows:

- Primary Sector
  - Agriculture, forestry and fishing;
  - Mining and quarrying.
- Secondary Sector
  - Manufacturing;
  - Electricity, gas, and water;
  - Construction.
- Tertiary Sector
  - Wholesale and retail trade, catering and accommodation;
  - Transport, storage and communication;
  - Finance, insurance, real estate and business services;
  - Community, social and personal services;
  - General government.

Economic performance of a municipal area's economic system in terms of, factors such as production activity can be measured by the GVA. The analysis will focus on the GVA produced by the primary, secondary and tertiary economic sectors over time.

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.

Albert Luthuli Local Municipality:

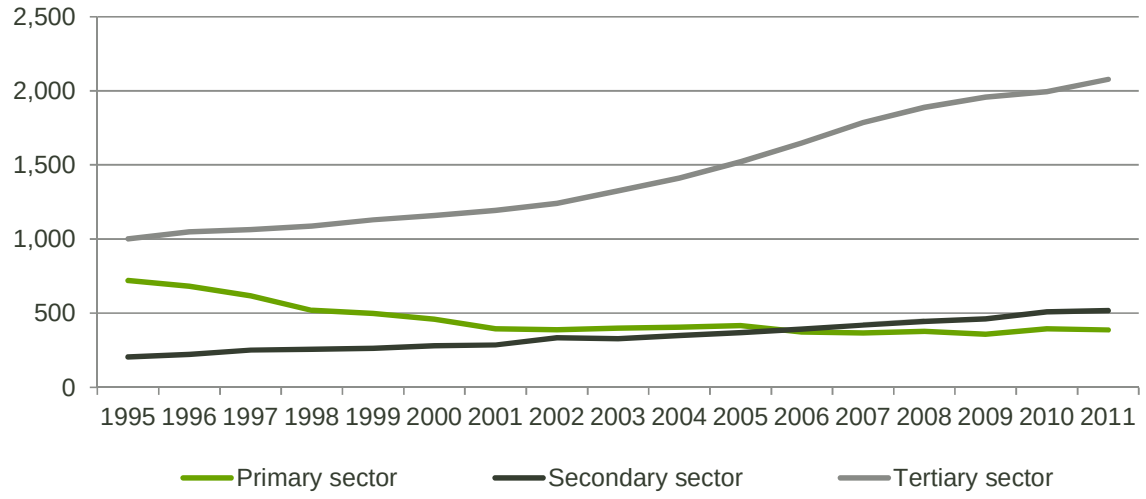

Figure 17: GVA per economic sector (R'million) – Albert Luthuli LM

Msukaligwa Local Municipality:

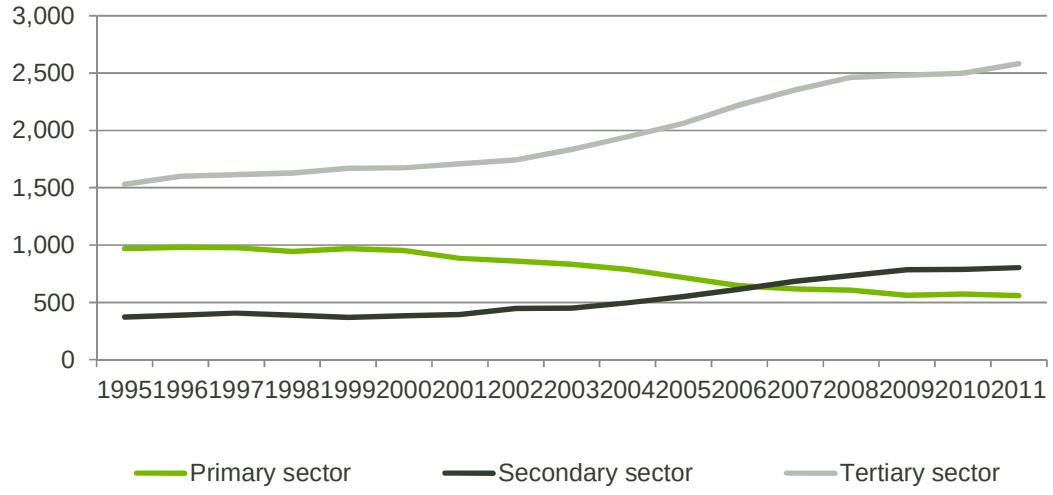

Figure 18: GVA per economic sector (R'million) – Msukaligwa LM

Mkhondo Local Municipality:

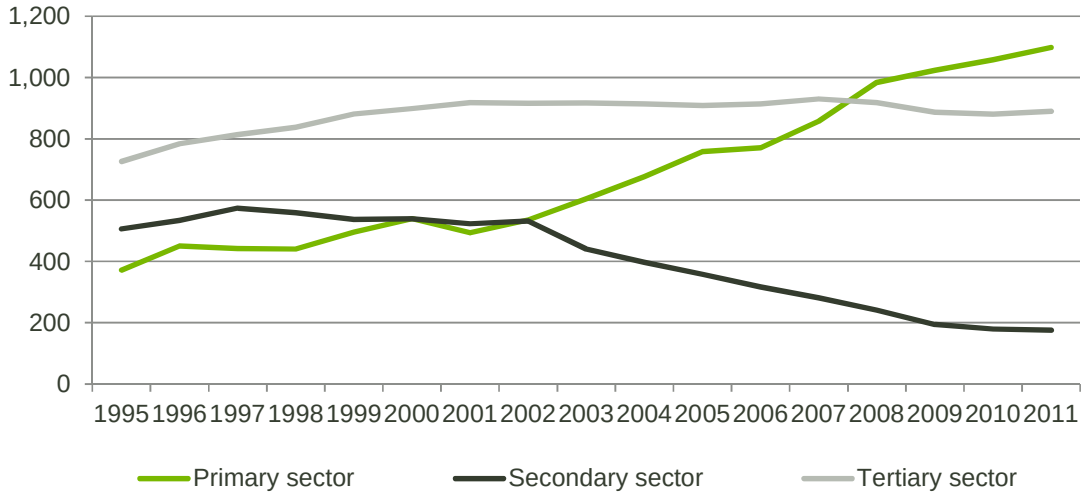

Figure 19: GVA per economic sector (R'million) – Mkhondo LM

Figure 17, Figure 18, and Figure 19 indicates the largest and strongest overall growing sector in the economy for the three LMs are the tertiary sector. This means its economy is dominated by the service sector. The secondary sector has shown some increase in recent years. The primary sector is getting smaller and does not contribute a lot to the economy in terms of GVA. The Mkhondo LM is however an exception, indicating a strong primary sector growth and a decrease in the secondary sector.

Despite the differences in growth for the employment sectors for the three LMs, Figure 20 indicates an overall growth in total GVA for each of the LMs.

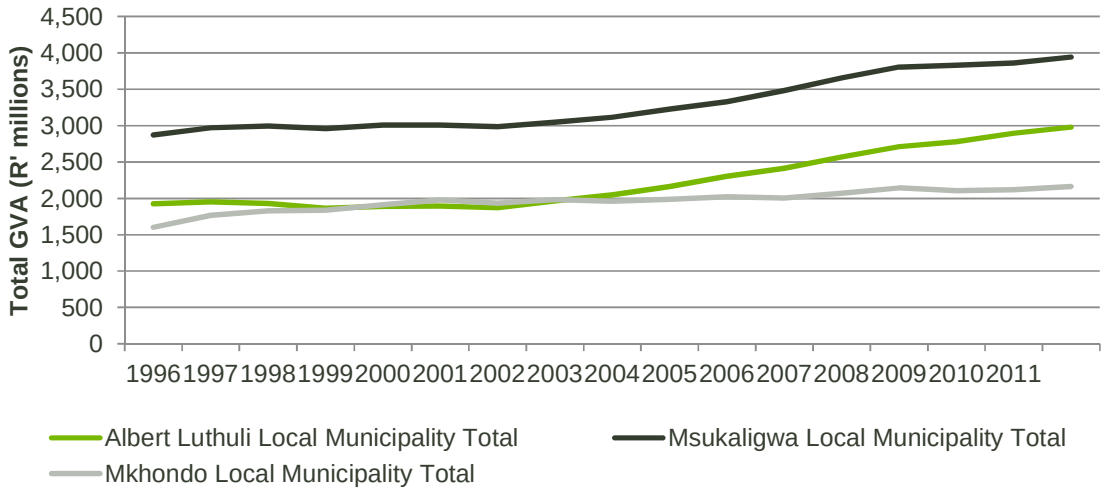

Figure 20: Comparative GVA

Diversification and concentration in the economy

The level of diversification or concentration of a municipal area's economy is measured by a tress index. A tress index of zero represents a totally diversified economy. On the other hand, the higher the index (closer to 100), the more concentrated or vulnerable the municipal area's economy to exogenous variables, such as adverse climatic conditions, commodity price fluctuations, etc.

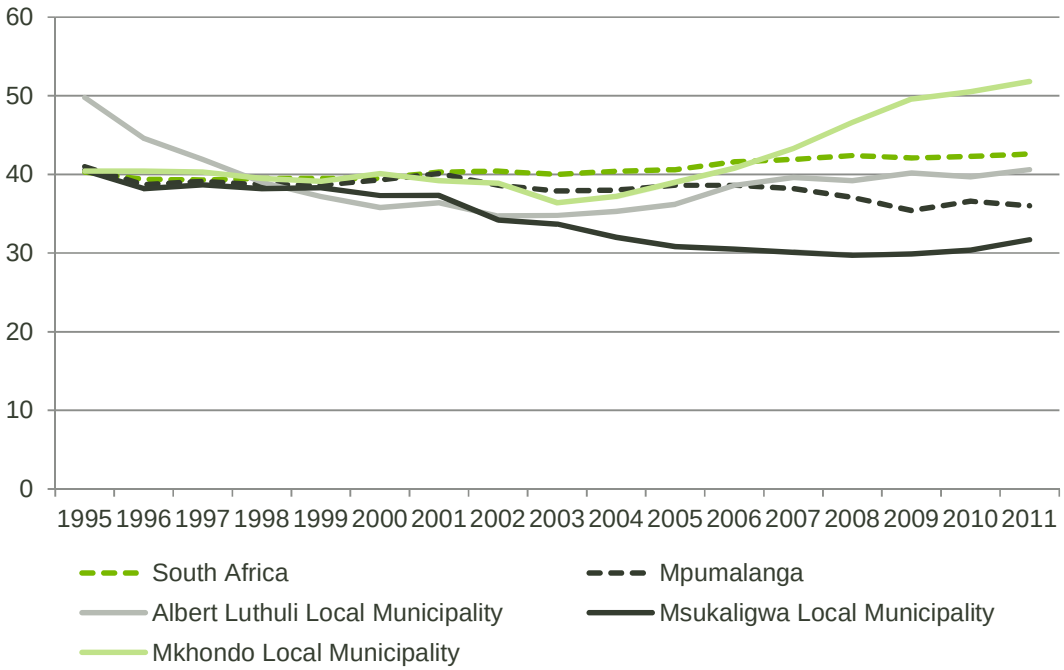

Figure 21: Tress index (10 industries) - Mpumalanga Section

The comparative tress index displayed in Figure 21 shows that the overall economy of the studied LMs is diversifying. Msukaligwa LM is the most diversified of the three LMs, and has higher diversification than Mpumalanga and South Africa. The diversity of the municipality also increased from 1995 to 2011. The Albert Luthuli LM shows an increase in diversification from 1995 and 2011, although there is a lot of variability in the trend. The diversification is lower than the total Mpumalanga's diversification, but still higher than South Africa's diversification. Mkhondo however showed a decrease in diversification. The level of diversification is also lower than the national and provincial level.

Location coefficient

Basic/Non-Basic ratios are calculated in order to determine the drivers of an economy. The ratio is expressed as the employment in a sector in the local economy divided by the total employment in the local economy. This is in turn divided by the same ratio for the district, provincial or national economy. A ratio greater than one, implies that there is relatively more employment in this sector than in the corresponding economy it is compared to. It therefore generates more than what can locally be consumed and the sector is thus a net exporting sector. This implies that it generates income for the local economy. The opposite is then true for ratios smaller than one.

Table 16: Location coefficient: South Africa

	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction	Wholesale and retail trade, catering and accommodation	Transport, storage and communication	Finance, insurance, real estate and business services	Community, social and personal services	General government
Albert Luthuli Local Municipality	2.14	1.31	0.81	0.86	0.51	1.34	0.71	0.65	1.16	1.40
Msukaligwa Local Municipality	2.19	1.50	0.69	3.19	0.57	1.22	1.95	0.45	1.09	0.74
Mkhondo Local Municipality	5.98	6.14	0.28	0.59	0.64	0.80	1.13	0.44	0.59	0.29

When compared at a national level, all three LMs show good performance for Agriculture and Mining. Additionally Albert Luthuli shows good performance for trade, community and governmental services, Msukaligwa shows good performance for in utilities, trade, transport and community services, and the Mkhondo LM shows good performance in transport. At this level agriculture is the municipalities' strongest performing sector as well as mining for Mkhondo LM and electricity for Msukaligwa.

Table 17: Location coefficient: Mpumalanga

	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction	Wholesale and retail trade, catering and accommodation	Transport, storage and communication	Finance, insurance, real estate and business services	Community, social and personal services	General government

Albert Luthuli Local Municipality	1.54	0.42	0.67	0.39	0.71	1.64	0.75	1.17	1.23	2.04
Msukaligwa Local Municipality	1.57	0.48	0.57	1.44	0.80	1.50	2.06	0.80	1.16	1.09
Mkhondo Local Municipality	4.29	1.95	0.23	0.27	0.90	0.98	1.19	0.79	0.63	0.42

In the provincial context Agriculture, construction and the government sector are highlighted as the most important economic activities. This shows the importance of the municipality in the province and the role it plays as a service centre starts to emerge.

Table 18: Location coefficient: Gert Sibande DM

	Agriculture, forestry and fishing	**Mining and quarrying**	**Manufacturing**	**Electricity, gas and water**	**Construction**	**Wholesale and retail trade, catering and accommodation**	**Transport, storage and communication**	**Finance, insurance, real estate and business services**	**Community, social and personal services**	**General government**
Albert Luthuli Local Municipality	1.02	0.38	0.62	0.39	0.76	1.19	0.89	1.44	1.90	2.99
Msukaligwa Local Municipality	1.05	0.43	0.53	1.45	0.85	1.09	2.46	0.99	1.79	1.59
Mkhondo Local Municipality	2.86	1.78	0.21	0.27	0.95	0.71	1.43	0.98	0.97	0.62

When economic sectors are analysed in terms of how well it functions at district level, some important aspects emerges. In the district, the municipalities' agricultural contribution is no longer seen as an important economic sector. This indicates that other local municipalities in the district contribute much more to this sector than municipal. Wholesale, Finance, and general government are the strongest sectors and this emphasises the role the municipality plays as an important service centre for the people in the municipality and those surrounding municipal areas.

Land use

This section will provide a general discussion of settlement patterns and major land uses in the Gert Sibande District Municipality.

Based on a high level assessment the following observations can be made:

- The Mpumalanga section of the rail line will primarily traverse across cultivated land, forest, woodlands, and plantations, as well as some mining areas.

Some detailed aspects of the land cover of the affected areas will be discussed in the following sections.

Gert Sibande District Municpality

The Gert Sibande district is the home of major industrial complexes in the province, such as the petro-chemical industries. This district also has a large agricultural sector with strong service centres like Standerton, Ermelo,

Bethal and Piet Retief. The settlement patter in this area has developed in orientation to the resource base and economic potential of the area. The agricultural sector, petrochemical industries and mining activities in the area have led to the distribution of service centres varying in size and function throughout the area. Informal settlements are also found scattered in this district municipality (CSIR, 2007).

The Mpumalanga Land Use Management Plan (Sisonke Development Planners, 2005est.) identified the following important settlements in the Gert Sibande district:

Table 19: Important settlements in the Gert Sibande district

Settlement Type	Town/City	Development Directive
Major Urban Centre	• Bethal; • Carolina; • Embalenhle; • Ermelo; • Evander; • Piet Retief; • Secunda; • Standerton; • Volksrust.	Aim of centres is to retain the current engineering, social, economic and institutional infrastructure and to strengthen and diversify the economy in order to achieve growth, prosperity and sustainability. The following industrial clustering opportunities should be explored: agriculture, chemical, forestry, and mining.
Rural settlement hubs	A total of 39 rural settlement hubs were identified.	Hubs should fulfill a rural support function. Each hub must accommodate the primary range of social and economic services. The hubs must provide accessibility to the hinterland, not only in the form of roads but also public transport facilities.

The Gert Sibande area has a strong agricultural sector that produces maize, sunflower, grain, sorghum, beef, dairy, wool, sheep and wheat. Other types of crops produced in the area incorporate potatoes, oil, seeds, maize and soybeans.

The area between Carolina, Bethal and Ermelo is one of the largest wool-producing areas in the country. The Standerton area is known for its large dairy industry and maize agriculture. The area of Ogies shows high soil potential for irrigation farming.

The district has an estimate of 1,750 commercial farmers, 2,300 emerging, and 5,300 subsistence farmers (MDALA, 2007b).

The area is also well endowed with coal and other mineral deposits and has some of the largest coal mines in South Africa. The major areas for coal in Gert Sibande District are concentrated around Bethal, Secunda, Standerton and Carolina. Linked with these coal mines are some of the world's largest coal fired power stations,

such as Majuba and Tutuka in Gert Sibande District. The area is however confronted by the tension between the agricultural activities in the sense that valuable agricultural land is being sterilised by mining activities (CSIR, 2007).

The Gert Sibande area has a strong manufacturing component, which is concentrated in the western part of the district, specifically the Secunda area (CSIR, 2007).

There is potential to expand small-scale eco-tourism activities in the vicinity of Chrissiesmeer, because of the unique grassland habitats and the bird life associated with the grassland and wetland areas. The establishment of stop-over facilities linked to the development of the bird watch tourism cluster adds value to the tourism potential of the Gert Sibande District (CSIR, 2007).

The forestry activities in the area relate to pine, eucalyptus and wattle plantations, which are concentrated in the eastern parts of the region stretching from Carolina, Lothair, and Amsterdam down to Piet Retief in the south. Mondi has a manufacturing facility in Gert Sibande, namely the Piet Retief mill. There exists tension between agriculture and forestry activities over the use of land (CSIR, 2007).

5.4 Cultural, Archaeological and Paleontological environment

A cultural and archaeological assessment was conducted as part of the initial plan of study for this EIA. However, upon review of the plan of study by the organs of state, Aurecon was requested to include a paleontological study in addition to the cultural and archaeological assessment. Both assessments are described below.

5.4.1 Cultural and Archaeological Assessement

In summary, the following can be said about the heritage sites in the area:

Stone Age

This is one period in the past that is not all that well presented. However, detailed surveys would undoubtedly rectify this, as all indications point to the existence of many more sites dating to this period.

Iron Age.

This period is chiefly represented by a specific type of sites. These are settlements that occur on the steep slopes of the escarpment area and are characterised by intricate stone walling. It is difficult to estimate the exact number of such sites that might exists, but it would probably run into thousands.

Historic period

Sites dating to the modern period are much more diverse in type, accounting for their large number. Many of them are still in use, e.g. farmhouses, shops and elements of the infrastructure such as bridges. As a more inclusive approach to the country's history is being written, many more new sites would undoubtedly be added to this category.

Description of the affected environment:

Stone Age:

The larger region has been inhabited by humans since Early Stone Age (ESA) times. Tools dating to this period are mostly, although not exclusively, found in the vicinity of watercourses. The original dating and evolutionary scheme for the development of tools during this early period, was based on a study of the river terrace gravels of the Vaal River in the Vereeniging region, referred to as the *Older*, the *Younger* and the *Youngest gravels* (Söhnge, Visser & Van Riet-Lowe1937; Breuil 1948). However, on subsequent investigation, the findings derived from this proved to be unacceptable as it was based on incorrect interpretations of the river gravels. It was only with the excavation of similar material from sealed, stratified sites, that it was realised that the material from the river gravels was not in is its primary context, having been uncovered and washed about over many millennia. Consequently, artefacts derived from such surface collections are now seen to have little significance.

The oldest of these tools are known as choppers, crudely produced from large pebbles found in the river. Later, *Homo erectus* and early *Homo sapiens* people made tools shaped on both sides, called bifaces. Biface technology is known as the Acheulean tradition, from St Acheul in France, where bifaces were first identified in the mid-19th century.

During Middle Stone Age (MSA) times (c. 150 000 – 30 000 BP), people became more mobile, occupying areas formerly avoided. According to Thackeray (1992) the MSA is a period that still remains somewhat murky, as much of the MSA lies beyond the limits of conventional radiocarbon dating. However, the concept of the MSA remains useful as a means of identifying a technological stage characterized by flakes and flake-blades with faceted platforms, produced from prepared cores, as distinct from the core tool-based ESA technology.

Open sites were still preferred near watercourses. These people were adept at exploiting the huge herds of animals that passed through the area, on their seasonal migration. As a result, tools belonging to this period also mostly occur in the open or in erosion dongas. Similar to the ESA material, artefacts from these surface collections are viewed not to be in a primary context and have little or no significance.

Late Stone Age (LSA) people had even more advanced technology than the MSA people and therefore succeeded in occupying even more diverse habitats. Also, for the first time we now get evidence of people's activities derived from material other than stone tools. Ostrich eggshell beads, ground bone arrowheads, small bored stones and wood fragments with incised markings are traditionally linked with the LSA.

LSA people preferred, though not exclusively, to occupy rock shelters and caves and it is this type of sealed context that make it possible for us to learn much more about them than is the case with earlier periods.

Only a few stratified sites are known to exist in the study area. One of these, called Hope Hill Shelter, was excavated by Wadley & Turner (1987). From the excavations it was determined that Late Stone Age people frequented the site sporadically, probable on a seasonal basis, in the time period approximately 4 400 years BP. Probably as a result of this absence of sites that were occupied on a long term basis, few sites containing rock art are known from the region.

Iron Age:

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known site at Silver Leaves south east of Tzaneen dating to AD 270. Having only had cereals (sorghum, millet) that need summer rainfall, Early Iron Age (EIA) people did not move outside this rainfall zone, and neither did they occupy the central interior highveld area. Because of their specific technology and economy, Iron Age people preferred to settle on the alluvial soils near rivers for agricultural purposes, but also for firewood and water.

The occupation of the larger geographical area (including the study area) did not start much before the 1500s. To understand all of this, we have to take a look at the broader picture. Towards the end of the first millennium AD, Early Iron Age communities underwent a drastic change, brought on by increasing trade on the East African coast. This led to the rise of powerful ruling elites, for example at Mapungubwe. The abandonment of Mapungubwe (c. AD 1270) and other contemporaneous settlements show that widespread drought conditions led to the decline and eventual disintegration of this state Huffman (2005).

By the 16th century things changed again, with the climate becoming warmer and wetter, creating condition that allowed Late Iron Age (LIA) farmers to occupy areas previously unsuitable, for example the Witwatersrand and the treeless, windswept plains of the Free State and the Mpumalanga Highveld.

This period of consistently high rainfall started in about AD 1780. At the same time, maize was introduced from Maputo and grown extensively. Given good rains, maize crops yield far more than sorghum and millets. This increase in food production probably led to increased populations in coastal area as well as the central highveld interior by the beginning of the 19th century.

This wet period came to a sudden end sometime between 1800 and 1820 by a major drought lasting 3 to 5 years. The drought must have caused an agricultural collapse on a large, subcontinent scale.

This was also a period of great military tension. Armed Qriqua and Korana raiders on horseback were active in the northern Cape and Orange Free State by about 1790. The Xhosa were raiding across the Orange River about 1805. Military pressure from Zululand spilled onto the highveld by at least 1821. Various marauding groups of displaced Sotho-Tswana moved across the plateau in the 1820s. Mzilikazi raided the plateau extensively between 1825 and 1837. The Boers trekked into this area in the 1830s.

Due to their specific settlement requirements, Late Iron Age people preferred to settle on the steep slope of a mountain, possibly for protection, or for cultural considerations such as grazing for their enormous cattle herds. Because of the lack of trees they built their settlements in stone.

A number of stone-walled archaeological sites, which are dated to the Late Iron Age (c. AD 1640 - AD 1830s), were identified in the study area, and some of them have been excavated (Taylor 1979, Pelser et al 2007). These sites are conventionally associated with Tswana-speaking people.

Ethno-history:

Whereas it is impossible to correlate any living group of people to Early Iron Age communities, it is possible, by using ethnographic evidence, to identify some of the groups of people that entered the region in pre-colonial times (i.e. the Later Iron Age) and are currently settled in the larger region. The Tswana-speakers were located to the south and west in the study area, with the Ndzundza Ndebele (Nguni-speakers) to the north. The eastern section of the study area was occupied by Swazi-speakers, also of Nguni origin.

Historic Period:

Things were set to change drastically during the early part of the 19th century. Not only was it a time of population movement resulting from events to the south and east, but it was also the arrival of the first white settlers in the area.

Currently, a large number of towns exist in the area, with Balfour, Secunda, Standerton and Piet Retief the larger ones. All of these date to the latter half of the 19th century and each has its own history as each developed for a particular reason. As they were small and largely served farming communities, they did not expand rapidly. Consequently, all of them retained many buildings (shops, houses, churches, schools) and other features (cemeteries) of heritage significance.

The various battles and skirmishes resulting from the conflict during the Anglo-Boer War (1899-1902) had a huge impact on heritage resources in the area, as many farms were burned down. Conversely, it also left a legacy of heritage sites scattered across the veld: fortifications and war cemeteries occur all over. Although most of the conflict centred on the railway line to Lourenço Marques (Maputo), located to the north, incidents also took place in other areas, e.g. Bakenlaagte (Cloete 2000).

However, the area remained up till today, a largely farming orientated community. Much of the heritage potential of the study area is therefore located within the many farmsteads in the area. Farmhouses and related structures (e.g. barns, sheds, etc.), as well as cemeteries dot the landscape. Equally important, are the homesteads, related structures and cemeteries of the farm labourers living on these farms.

Industrial and mining activities also took place in the region, on an ever increasing scale. Coal mining dates to the beginning of the 20th century, although there is written evidence that it was exploited by farmers prior to that. Forestry also became a big operation, going back as far as the early 1900s.

5.4.2 Paleontological Assessment

The section between Davel and Nerston in Mpumalanga is underlain by Jurassic dolerite, Permian Vryheid Formation sediments and ancient metamorphic and igneous rocks. The proposed alternative routes on the Davel to Nerston section (from Westoe Dam to Nerston) is underlain by ancient metamorphic and igneous rocks, with a very small section underlain by Permian Vryheid Formation sediments. The areas underlain by the Vryheid Formation have been allocated a High Paleontological Sensitivity. Sections underlain by igneous and metamorphic rocks were allocated a Low Paleontological Sensitivity.

6 ISSUES IDENTIFIED DURING THE SCOPING PHASE

The proposed construction and upgrade of the Davel to Nerston 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 to date by both the specialists and the I&APs are indicated below. The Plan of Study for the EIA in Appendix B provides a detailed indication of how these issues will be addressed.

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

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

Eighty one (81) non-perennial and seven (7) perennial watercourses cross the existing, as well as the proposed 35 m wide railway corridors. These watercourses form the basis for identifying potential wetland and riparian areas to be investigated during field surveys.

All waterbodies that lie within 500 m 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. 1199 dated 18 December 2009) due to the complexity and potentially cumulative impact on a wetlands and rivers and the resources as a whole. Therefore all activities within 500 m of wetlands or rivers should be subject to an application for authorization.

The Davel - Nerston line will traverse a number of important habitats:

- Irreplaceable - development criteria = “linear developments are restricted”
- Highly significant – development criteria = “linear developments are restricted”
- Important or necessary (ecosystem functioning or corridors) - development criteria = “linear developments are restricted”

The remaining areas were categorised as follows:

- No Natural habitat remaining - development criteria = “linear developments are permitted”

- Least concern - development criteria = “linear developments are permitted”

A portion of the line falls within two Highly Significant catchments. This is possibly due to this catchment forming part of the catchment divide between the Vaal River and the Olifants. Most of these rivers are categorised with a 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 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 2 - Loss of corridors
- Impact 3 - Loss of ecotones

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

Eighty one (81) non-perennial and seven (7) perennial watercourses cross the existing, as well as the proposed 35 m 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, refuelling yards, maintenance and/or passing loops will be extensively surveyed to identify all wetlands and riparian areas within 500 m of the proposed activity footprints. Relevant functional and integrity assessments will be conducted based on the findings of the site survey. The findings of these assessments will be included in the EIA report.

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. This will be assessed during the EIA phase.

6.1.3 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; and
- 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; and
- Establishment / upgrading of services.

6.1.4 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.

6.1.5 Safety and Security Aspects

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

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 EMPr.

6.2 Issues raised during the Public Participation Process

The following issues in Table 20 constitute an extract from the issues and response report (IRR) and the Minutes captured at the public and focus group meetings for the Davel to Nerston 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.

Table 20: Issues and Responses

Issue	Response
A concern was raised regarding the safety of level crossings. Dense mist is an issue in certain areas – which makes crossing the railway line dangerous.	The engineers are prioritising the removal of level crossings where possible. However, it is likely that level crossings on private roads will remain. This issue has been forwarded to the Transnet

	engineers for consideration in the design.
Farmers raised concern that the exact alignment has not yet been established. Farmers feel that they cannot adequately comment on the impact the project might have on them if they do not know the exact alignment.	The EIA investigation must inform the alignment of the rail following consideration of environmental, social and economic aspects.
The community raised concern regarding the impact on the Usuthu River.	The impact on the Usuthu River and all other watercourses affected by the proposed project will be thoroughly investigated by the Ecologist and Wetland specialists during the EIA phase.
The Nu Scotland Farmers Association [also known as the Lothair Farmers Association] explained that they had proposed an alternative alignment to Transnet in 2012. The Farmers Association requested that an answer as to the feasibility of this alternative be given to them by Transnet as, according to them, it reduces the social and aquatic impacts of the project dramatically.	The concept for opening up a rail corridor between Richards Bay and Maputo commenced in 2010, this concept was formalised into a concept level study which identified potential route options. The idea was to have the shortest route through an already established network taking full advantage of already installed infrastructure. Based on these requirements 4 potential options were identified. These 4 options were subject to a pre-feasibility study which included looking at social, environmental and technical aspects. The findings of the pre-feasibility study narrowed it down to two potentially feasible routes which are the routes currently under consideration, namely alternative routes 4 and 4a.
Potentially significant impact on Sappi infrastructure	SAPPI is requested to submit preliminary concerns based on the available information. Comments received after the 23 of August 2013 will still be captured and considered in the EIA Report. Further opportunities to comment will become available with release of the Final Scoping Report, the Draft EIA Report and submission of the Final EIA Report.
It was noted that there are many graves in the area. Would the impact of the railway line on these graves be considered?	The Heritage Impact Assessment will identify affected areas and the appropriate mitigation will be determined and specified in the EIA Report.
Will the project be shelved if neither of the two route options is found feasible following the EIA investigation?	No fatal flaws were identified during the pre-feasibility study therefore the decision was made to continue with the EIA Process on the two route options. However it is still possible that the current EIA investigation could identify a fatal flaw which went unnoticed during the pre-feasibility study. If the project is fatally flawed it will not receive approval from the Competent Authority. Transnet could then decide to investigate additional alternatives.
Is deviation possible within the route corridor to limit impacts to sensitive environmental	Some deviation within the 200 m corridor (100 m on either side of the railway line) is possible, but it

features	will have to be considered by the engineers to determine the impact to the alignment further down the line. Furthermore the specialist investigations to be undertaken will consider impacts and determine mitigation for sensitive areas. If these investigations find that impacts to a sensitive environment cannot be successfully mitigated and that the environmental impact thereof is of such a significance it will require Transnet to reconsider the placement of the routes within these sensitive areas as it will not receive support from the Competent Authority
A major issue for the local community is that in the past promises have been made for the provision of jobs on such projects as this railway link, and then once construction commenced labourers from elsewhere were appointed and the local community did not benefit.	Transnet responded as follows: As far as reasonable labour and supplies should be sourced from local communities. The project should also aim to contribute to skills transfer.
What is the date for commencement of construction	There are two processes that need to be considered in terms of timeframes. Firstly the EIA Process which is currently underway. Transnet cannot commence with construction until the EIA Process is finalised and Environmental Authorisation has been issued by the Competent Authority. This process is anticipated to be finalised by July 2014. Therefore Transnet anticipates that should the project be approved that construction can only commence thereafter, this date is also still dependent on the detailed designs to be given by the engineers.
If you are employed once construction commences will that employment be applicable to construction on all sections of the railway line [for instance will it extend into Swaziland)	An important socio economic benefit of the project relates to the provision of job opportunities to the local communities where the construction is taking place. If labourers for instance, from Davel, continue construction into Swaziland it is anticipated to create conflict within local communities in Swaziland who may feel that it is unfair that workers from outside their community has been provided with the work

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 was conducted in the EIA phase, based on alternatives identified during the Scoping Phase (Chapter 1.6). These alternatives include evaluation of the no-go option; alternatives to site selection; and alternatives to construction methodologies and site layout.

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 EIR are appended to this report and will be made available during the required comment periods.

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 21). 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 21: Criteria for the evaluation of environmental impacts

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**Regional**	Beyond a 10 km radius of the proposed construction site.
	Local	Within a 10 km radius of the centre of the proposed construction site.
	Site specific	On site or within 100 m 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.

Table 22: 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; and • 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; and • 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; and • Very low intensity with a regional extent and long term duration.
Very low	• Low intensity with a site specific extent and construction period duration; and • 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 23 and Table 24 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 25.

Table 23: 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 24: 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 25: 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 proposed activities described in Chapter 1 as well as the impacts predicted during the scoping phase as described 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 tems “No Mit” and “Mit” reflected in the assessment tables in this chapter refer to the impact with no mitigation and with potential mitigation respectively. **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.**

Certain predicted impacts assessed were found to have the very same potential effects on the environment for both the new route alternatives (4 and 4a) and the original route alignment. In such cases no distinction between the routes were indicated as part of the impact assessment description. In cases where there was found to be a difference in potential impact, such distinction was made and is described in each separate specialist area in this chapter.

8.2 Summary of impacts

Table 26 contains a summary of the various predicted impacts assessed by the specialists and scores each impact for both the pre- and post-mitigation phases. From section 8.3 onwards each of these impacts are described individually together with an impact description table and accompanying mitigation measures.

Table 26: Summary table of the impacts assessed during the EIA phase

Impact	Pre-mitigation:						Post-mitigation:					
	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance
Loss of habitat and removal of vegetation - terrestrial	Short-term	Site-specific	Low - negative	Negligible	Certain	Low - negative	Short-term	Site-specific	Very low	Negligible	Certain	Very low
Loss of habitat and removal of vegetation - wetland and waterbodies	Short-term	Site-specific	Moderate - negative	Slightly detrimental	Certain	Low - negative	Short-term	Site-specific	Low - negative	Negligible	Certain	Low - negative
Loss of habitat and removal of vegetation - wetland and waterbodies (alt4)	Short-term	Site-specific	Low - negative	Negligible	Certain	Low - negative	Short-term	Site-specific	Very low	Negligible	Certain	Very low
Loss of habitat and removal of vegetation - wetland and waterbodies (alt4a)	Short-term	Site-specific	Moderate - negative	Slightly detrimental	Certain	Low - negative	Short-term	Site-specific	Low - negative	Negligible	Certain	Low - negative
Loss of corridors and habitat fragmentation	Long-term	Local	Moderate - negative	Moderately detrimental	Certain	High - negative	Long-term	Local	Low - negative	Moderately detrimental	Certain	Moderate - negative
Loss of rare and endangered species	Long-term	Regional	Low - negative	Moderately detrimental	Unlikely	Low - negative	Long-term	Regional	Low - negative	Moderately detrimental	Unlikely	Low - negative
Introduction of alien and invasive species	Medium-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative	Long-term	Site-specific	Very low	Negligible	Fairly likely	Very low
An increase in soil erosion	Short-term	Site-specific	Low - negative	Negligible	Fairly likely	Very low	Short-term	Site-specific	Very low	Negligible	Fairly likely	Very low
Hydrological impacts on wetlands	Long-term	Site-specific	Moderate - negative	Moderately detrimental	Fairly likely	Low - negative	Long-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative
Hydrological impacts on wetlands (alt4)	Long-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative	Long-term	Site-specific	Very low	Negligible	Fairly likely	Very low
Hydrological impacts on wetlands (alt 4a)	Long-term	Site-specific	Moderate - negative	Moderately detrimental	Fairly likely	Low - negative	Long-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative

Impact	Pre-mitigation:						Post-mitigation:					
	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance
Initial day and night scenario	Long-term	Regional	Very high - negative	Extremely detrimental	Certain	Very high - negative	Long-term	Regional	Moderate - negative	Highly detrimental	Certain	High - negative
Future day and night scenaria	Long-term	Regional	Very high - negative	Extremely detrimental	Certain	Very high - negative	Long-term	Regional	Moderate - negative	Highly detrimental	Certain	High - negative
Disturbance, introduction of sediments or erosion of banks or channel	Medium-term	Local	Low - negative	Slightly detrimental	Fairly likely	Low - negative	Short-term	Site-specific	Very low	Negligible	Fairly likely	Very low
Disturbance, introduction of sediments or erosion of banks or channel (alt4)	Medium-term	Local	Very low	Negligible	Fairly likely	Very low	Short-term	Site-specific	Very low	Negligible	Fairly likely	Very low
Disturbance, introduction of sediments or erosion of banks or channel (alt4a)	Medium-term	Local	Very low	Negligible	Fairly likely	Very low	Short-term	Site-specific	Very low	Negligible	Fairly likely	Very low
Change in flow regime	Long-term	Local	Low - negative	Moderately detrimental	Fairly likely	Low - negative	Long-term	Site-specific	Very low	Negligible	Unlikely	Very low
Change in flow regime (alt4)	Long-term	Local	Very low	Negligible	Fairly likely	Very low	Long-term	Site-specific	Very low	Negligible	Unlikely	Very low
Change in flow regime (alt4a)	Long-term	Local	Very low	Negligible	Fairly likely	Very low	Long-term	Site-specific	Very low	Negligible	Unlikely	Very low
Water abstractions, effluent discharges, animal drinking.	Short-term	Local	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative	Short-term	Site-specific	Low - negative	Negligible	Fairly likely	Very low
Coal dust and rainfall seepage water from the coal wagons.	Long-term	Local	Low - negative	Moderately detrimental	Fairly likely	Low - negative	Long-term	Site-specific	Very low	Negligible	Fairly likely	Very low
Disturbance of cultural and hertiage resources	Long-term	Regional	High - negative	Highly detrimental	Fairly likely	Moderate - negative	Long-term	Regional	Moderate - negative	Highly detrimental	Fairly likely	Moderate - negative
Creation of employment opportunities	Short-term	Local	Moderate - positive	Slightly beneficial	Certain	Moderate - positive	Short-term	Local	High - positive	Moderately beneficial	Certain	Moderate - positive
BEE opportunities	Medium-term	Regional	Moderate - positive	Moderately beneficial	Very likely	Moderate - positive	Long-term	Regional	Moderate - positive	Highly beneficial	Certain	High - positive

Impact	Pre-mitigation:						Post-mitigation:					
	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance
Influx of job seekers	Short-term	Local	Moderate - negative	Slightly detrimental	Very likely	Low - negative	Short-term	Local	Low - negative	Slightly detrimental	Very likely	Low - negative
Outflow of labour	Medium-term	Local	Moderate - negative	Moderately detrimental	Fairly likely	Low - negative	Medium-term	Local	Low - negative	Slightly detrimental	Fairly likely	Low - negative
Creation of informal settlements	Long-term	Regional	Low - negative	Moderately detrimental	Fairly likely	Low - negative	Short-term	Local	Very low	Negligible	Fairly likely	Very low
Social pathologies arising from population influx	Medium-term	Local	Low - negative	Slightly detrimental	Fairly likely	Low - negative	Medium-term	Local	Very low	Negligible	Fairly likely	Very low
Increase in crime levels	Medium-term	Local	Low - negative	Slightly detrimental	Fairly likely	Low - negative	Short-term	Local	Very low	Negligible	Fairly likely	Very low
Accommodation for construction staff	Short-term	Local	Low - negative	Slightly detrimental	Very likely	Low - negative	Short-term	Local	Very low	Negligible	Fairly likely	Very low
Physical intrusion (Construction phase)	Short-term	Site-specific	Moderate - negative	Slightly detrimental	Certain	Low - negative	Short-term	Site-specific	Moderate - negative	Slightly detrimental	Certain	Low - negative
Physical intrusion (operational phase)	Long-term	Site-specific	Moderate - negative	Moderately detrimental	Certain	Moderate - negative	Long-term	Site-specific	Low - negative	Slightly detrimental	Certain	Moderate - negative
Displacement of people/households	Short-term	Local	High - negative	Moderately detrimental	Certain	Moderate - negative	Short-term	Local	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative
Community perceptions and responses	Short-term	Local	Low - negative	Slightly detrimental	Fairly likely	Low - negative	Short-term	Local	Low - negative	Slightly detrimental	Unlikely	Very low
Creation / sustaining of employment opportunities (operational phase)	Long-term	Local	Moderate - positive	Moderately beneficial	Fairly likely	Low - positive	Long-term	Local	High - positive	Highly beneficial	Fairly likely	Moderate - positive
Local and regional economic benefits (operational phase)	Long-term	Regional	Moderate - positive	Highly beneficial	Fairly likely	Moderate - positive	Long-term	Regional	Moderate - positive	Highly beneficial	Fairly likely	Moderate - positive

Impact	Pre-mitigation:						Post-mitigation:					
	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance
Macro-economic CAPEX Regional	Short-term	Regional	High - positive	Moderately beneficial	Very likely	Moderate - positive	N/A	N/A	N/A	N/A	N/A	N/A
Macro-economic CAPEX Local	Short-term	Local	High - positive	Moderately beneficial	Very likely	Moderate - positive	N/A	N/A	N/A	N/A	N/A	N/A
Macro-economic OPEX Regional	Long-term	Regional	Low - positive	Moderately beneficial	Very likely	Moderate - positive	N/A	N/A	N/A	N/A	N/A	N/A
Potential hydrocarbon spillages from equipment, machinery and vehicle storage may lead to contamination of groundwater.	Long-term	Regional	Very high - negative	Extremely detrimental	Fairly likely	Moderate - negative	Short-term	Site-specific	Very low	Negligible	Unlikely	Very low
Potential waste leakages / spillages in construction camp may lead to contamination of groundwater.	Long-term	Regional	Very high - negative	Extremely detrimental	Fairly likely	Moderate - negative	Short-term	Site-specific	Very low	Negligible	Unlikely	Very low
Incorrect disposal of hazardous and non-hazardous materials or waste could contaminate groundwater.	Long-term	Regional	Very high - negative	Extremely detrimental	Fairly likely	Moderate - negative	Short-term	Site-specific	Very low	Negligible	Unlikely	Very low
Contaminated ballast stone may lead to contamination of groundwater.	Long-term	Regional	Very high - negative	Extremely detrimental	Fairly likely	Moderate - negative	Short-term	Site-specific	Very low	Negligible	Unlikely	Very low
Spillages of hazardous materials resulting from accidents or collisions may result in contamination of groundwater.	Medium-term	Local	Very high - negative	Highly detrimental	Unlikely	Low - negative	Short-term	Site-specific	Very low	Negligible	Unlikely	Very low
Wind blown material eminating from uncovered rail trucks may result in contamination of groundwater.	Long-term	Regional	Moderate - negative	Highly detrimental	Fairly likely	Moderate - negative	Short-term	Site-specific	Very low	Negligible	Unlikely	Very low
Dust releases from earthworks	Short-term	Local	High - negative	Moderately detrimental	Fairly likely	Low - negative	Short-term	Local	Low - negative	Slightly detrimental	Unlikely	Very low
Construction vehicle exhaust	Short-term	Local	High - negative	Moderately detrimental	Fairly likely	Low - negative	Short-term	Local	Very low	Negligible	Fairly likely	Very low
Contribution to ambient CO	Medium-term	Local	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative	Medium-term	Local	Very low	Negligible	Very unlikely	Very low

Impact	Pre-mitigation:						Post-mitigation:					
	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance
Contribution to ambiet PM_{10}	Medium-term	Local	High - negative	Moderately detrimental	Very likely	Moderate - negative	Short-term	Local	Very low	Negligible	Unlikely	Very low
Contribution to ambient NO_2	Long-term	Regional	High - negative	Highly detrimental	Very likely	High - negative	Short-term	Local	Very low	Negligible	Unlikely	Very low
Contribution to ambient C_6H_6	Medium-term	Local	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative	Short-term	Local	Very low	Negligible	Unlikely	Very low

Note that as the macro-economic impacts cannot be mitigated, the post-mitigation columns are entered as not applicable.

8.3 Impacts on the Biophysical Environment

8.3.1 Ecological assessment

Three alternatives were assessed individually by the Ecologist. The individual impacts can be compared in the impact description tables.

The following general methods were used in assessing the study area, which included the 35 m wide footprint of the proposed rail line area and 500 m 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; and
- 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.

8.3.1.1 Terrestrial habitats

The study area is dominated by commercial crop production, forestry and secondary grasslands and wetlands (Figure 22 & Figure 23). The secondary grasslands are important in maintaining ecological links between the remaining areas the wetlands and rivers. This was highlighted by the fact the majority of the faunal species observed were found within the grassland / rocky outcrop areas adjacent to the pans and riverine areas.

Figure 22: Typical landscape within the western portion of the study area

Figure 23: The typical environment of the central portion of the project near Lothair, containing forestry and endorheic pans.

As explained in Chapter 5, Mucina and Rutherford (2006) describe four regional vegetation types along the Davel to Nerston rail line route. Little of the natural vegetation remains within the study area, due to the existing impacts (grazing, farming and foresty), together with the present road and rail infrastructure. Thus not only has the environment been impacted upon (loss of species diversity) but a large degree of habitat fragmentation has also occurred.

The following species were observed during the survey:

Table 27: Species observed on the Davel to Nerston proposed route

Species	Common Name	Conservation Status	CARA status (where applicable)
Plants			
Halopcarpha scaposa	Bietou	-	-
Solanum spp		-	Category 1
Themeda triandra	Rooigras	-	-
Aristida junciformis	Ngongoni three awn	-	-
Oenothera tetraptera	Evening primrose	-	-
Gomphocarpus fructicosus	Milk weed	-	-
Selago spp	-	-	-
Plantago lanceolata	Ribwort	-	-
Senecio spp	-	-	-
Hyparrhenia hirta	Common Thatching Grass	-	-
Cymbopogon plurinodes	Narrow-leaved turpentine grass	-	-
Digitaria eriantha	Finger grass	-	-
Acacia mearnsii	Black wattle	-	Category 2
Eucalyptus spp	Gum	-	Category 2
Aloe greatheadii	Spotted Aloe	-	
Cynodon dactylon	Kweek	-	-
Imperata cylindrica	Cottonwool grass	-	-
Salix babylonica	Weeping willow	-	Category 2
Quercus spp	Oak trees	-	-
Populus x canescens	Grey poplar	-	Category 2
Bulbostylis schoenoides	Sedge	-	
Schoenoplectus spp			
Aloe cooperi	-	-	-
Pteridium aquilinum	Bracken fern	-	Indigenous invader
Birds			
Vanellus armatus	Blacksmith lapwing	-	
Bostrychia hagedash	Hadeda ibis	-	

Species	Common Name	Conservation Status	CARA status (where applicable)
Motacilla capensis	Cape Wagtail	-	
Passer domesticus	House sparrow	-	
Bubulcus ibis	Western cattle egret	-	
Corvus capensis	Cape Crow	-	
Ardea melanocephala	Black-headed heron	-	
Fulica cristata	Red-knobbed coots	-	
Greater flamingo	Flamingo	Near Threatened	
Lanius collaris	Common Fiscal Shrike	-	
Scopus umbretta	Hamerkop	-	
Pelecanus onocrotalus	Great White Pelican	Near Threatened	
Mammals			
Canis mesomelas	Black-backed jackal	-	
Lepus saxatilis	Scrub Hare	-	
Tatera brantsii	Highveld gerbil	-	

The birds and mammal species observed were mostly associated with the large endorheic pans between the Burgerpan siding and Lothair. The siting of a solitary Pelican, a Near Threatened species was unusual for the region, but is indicative of the functional importance of the large pans that still contained surface water during a dry period. The Flamingos, also a Near Threatened species are observed on a regular basis, based on birding information for the Chrissiesmeer region just north of the proposed line.

8.3.1.1.1 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.

Significance of impacts with 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 low, the overall significance of would be rated as Low without mitigation and very low with 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 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 for all the alternatives

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: Negligible	Significance: Low - negative
Extent	Site-specific	Will result in the disturbance of the vegetation and soils within the sites		
Intensity	Low - 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 15 m 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. Applications must be submitted to the Department of Agricultural, Fisheries and Forestry (DAFF) and the Provincial Department of the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) where applicable. • 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: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Very low	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 railway 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 EMPR 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.

8.3.1.2 Aquatic habitats

As described in Chapter 5, the Davel to Nerston line for the most part falls along the Upper Vaal and Olifants rivers catchment divide and both of these catchments contain numerous small streams / rivers and the endorheic pans. All of these systems have been classified as part of the National Freshwater Ecosystem Priority Atlas (NFEPA) project (Nel *et al*., 2012).

Notably the endorheic pans found are largely natural and are importance aquatic ecosystems within the region with regard bird and small mammal populations as shown in this study, i.e. Gerbils, Hares, and Jackals. Figure 24 depicts the remaining wetland systems, namely the endorheic pan and seep wetlands, with the proposed 50 m buffer and the Section 21 Water Use License Application (WULA) 500m zone, i.e. sections of the alignment will require a WULA to be submitted to the Department of Water Affairs.

The Present Ecological State of these systems is currently being evaluated using an updated methodology by the Water Research Commission and the Department of Water Affairs. This information still needs to be verified and should be available once the WULA applications for this project need to be submitted. However it would seem that most of the systems rated, for the region (rivers and wetlands) were rated with a PES of C or D, while the Ecological Importance and Sensitivity (EIS) was rated as High. The rationale for the high EIS scores due to the importance of habitat these systems provide within an environment that has largely been altered or modified.

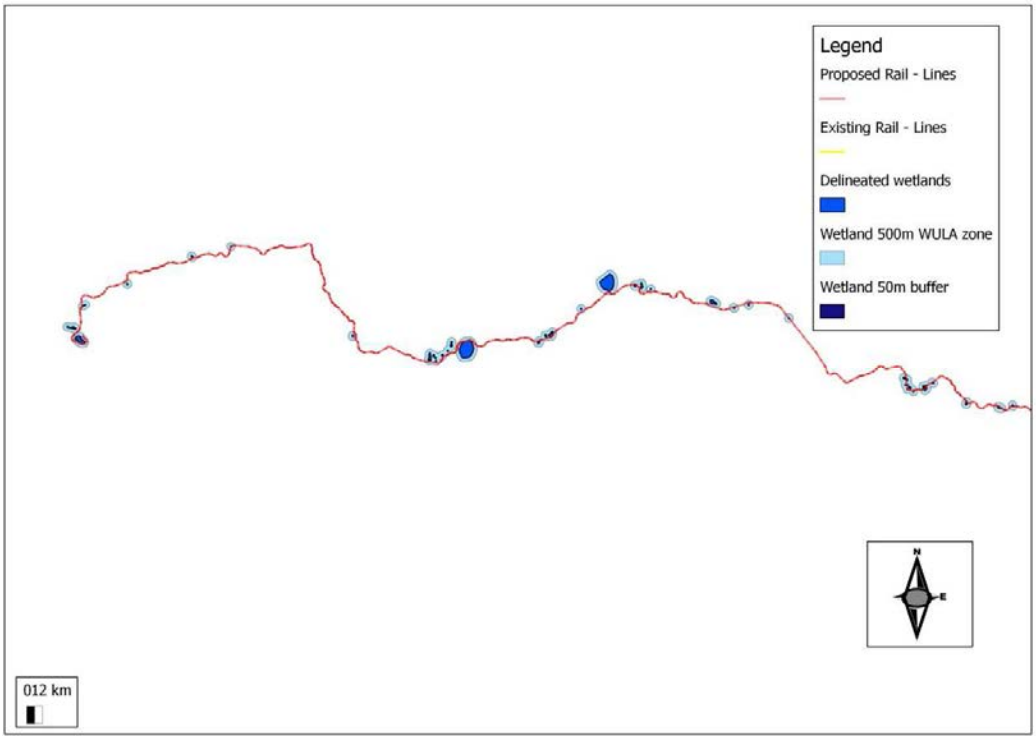

Figure 24: Delineated wetland systems with the prescribed 50 m ecological buffer and the 500 m Water Use License Application zone

8.3.1.2.1 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 observed pans and valley head seeps with regard physical loss of catchment, wetland area and changes to the local hydrology. Several of the proposed areas will also impact on the proposed 50 m ecological buffer with regard the line upgrading, i.e. no loops are proposed within these areas. Should this occur then there would be a reduction in the physical and as well as the functional attributes of the wetland system. 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 with 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 low, the overall significance of would be rated as Low, with or without mitigation (Table 29).

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 tables below indicate the impact description as well as mitigation measures proposed for the three route alternatives.

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

IMPACT DESCRIPTION: Loss of habitat and removal of vegetation - wetland and waterbodies				
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: Low - negative
Extent	Site-specific	The increase in rail footprint would have an impact on the observed pans and valley head seeps with regard physical loss of catchment, wetland area and changes to the local hydrology		

Intensity	Moderate - negative	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		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation		

MITIGATION:

- Alternative 4 is selected, as opposed to 4a for the Nerston section of the proposed line. This will minimise the impact on wetland areas in particular.
- 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. Applications must be submitted to the Department of Agricultural, Fisheries and Forestry (DAFF) and the Provincial Department of the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), where applicable.
- 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: Negligible	Significance: Low - negative
Extent	Site-specific	As for pre-mitigation		
Intensity	Low - negative	Mitigation will reduce the negative impact		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation in the aquatic environment		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the railway line will be constructed adjacent to the existing line, 15 m 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 EMPr 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 75 m. Should additional space be needed for the temporary storage of material, the ECO must advise on an appropriate area away from any sensitive areas**.

Table 30: Impact description for the loss of habitat and removal of vegetation in the aquatic habitat for alternative 4

IMPACT DESCRIPTION: Loss of habitat and removal of vegetation - wetland and waterbodies (alt4)				
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: Negligible	Significance: Low - negative
Extent	Site-specific	The increase in rail footprint would have an impact on the observed pans and valley head seeps with regard physical loss of catchment, wetland area and changes to the local hydrology.		
Intensity	Low - negative	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.		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation in the aquatic environment		
MITIGATION: • Alternative 4 is selected, as opposed to 4a for the Nerston section of the proposed line. This will minimise the impact on wetland areas in particular. • 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. The floodplain / wetlands habitats identified within the development footprint should be retained in its current state in order to prevent complete removal/destruction of the floodplain/wetland. . • 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. Applications must be submitted to the Department of Agricultural, Fisheries and Forestry (DAFF) and the Provincial Department of the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), where applicable. • 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: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Very low	Appropriate mitigation will reduce the potential negative impacts		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation in the aquatic environment		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the railway line will be constructed adjacent to the existing line, 15 m 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 EMPr 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 75 m. Should additional space be needed for the temporary storage of material, the ECO must advise on an appropriate area away from any sensitive areas**.

Table 31: Impact description for the loss of habitat and removal of vegetation in the aquatic habitat for alternative 4a

IMPACT DESCRIPTION: Loss of habitat and removal of vegetation - wetland and waterbodies (alt4a)				
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: Low - negative
Extent	Site-specific	The increase in rail footprint would have an impact on the observed pans and valley head seeps with regard physical loss of catchment, wetland area and changes to the local hydrology		
Intensity	Moderate - negative	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.		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation in the aquatic environment		

MITIGATION:

- Alternative 4 is selected, as opposed to 4a for the Nerston section of the proposed line. This will minimise the impact on wetland areas in particular as alternative 4 crosses a lower number of wetlands and the crossing points are very narrow compared to alternative 4a and the original proposed alignment.
- 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. The floodplain / wetlands habitats identified within the development footprint should be retained in its current state in order to prevent complete removal/destruction of the floodplain/wetland
- 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. Applications must be submitted to the Department of Agricultural, Fisheries and Forestry (DAFF) and the Provincial Department of the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), where applicable.
- 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: Negligible	Significance: Low - negative
Extent	Site-specific	As for pre-mitigation		
Intensity	Low - negative	Appropriate mitigation will reduce the potential negative impacts		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation in the aquatic environment		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the railway line will be constructed adjacent to the existing line, 15 m 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 EMPR 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 75 m. Should additional space be needed for the temporary storage of material, the ECO must advise on an appropriate area away from any sensitive areas**.

In light of the above impact descriptions for the wetlands and waterbodies impacted on by the proposed project, alternative 4 (as opposed to the original alignment and new alternative 4a) is favoured from an ecological perspective.

8.3.1.2.2 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 with mitigation

The magnitude of this impact would however be Low due to the site scale of the operations in the construction phase as well as during the operational phase. Should surface water run-off be managed, in way of mitigation, using a storm water management plan, then overall significance would be Very Low for the construction and operations phase.

The table below indicates the impact description as well as mitigation measures proposed, representative of all three route alternatives.

Table 32: Impact description of the increase in soil erosion

IMPACT DESCRIPTION: An increase in soil erosion				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning

Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Short-term	During construction denuded and bare areas should be monitored and managed to reduce the surface water felocity and downstream deposit of sediment	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Erosion could occur on denuded soil although it could have a downstream impact by way of sediment depositing		
Intensity	Low - negative	Due to the site scale of the operations in the construction phase as well as during the operational phase		
Probability	Fairly likely	Due to the type of activity the potential exist for erosion on denuded soil		
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.				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Very low	Mitigation measures will decrease the intensity of erosion		
Probability	Fairly likely	Mitigation will decrease probability of erosion on cleared areas		

8.3.1.2.3 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 wetland areas.

Proposed 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., which if so doing alter these systems by forming impoundments as shown in Figure 25.

Figure 25: Excess ballast falls into the culverts that creates berms, which then impedes flow.

The tables below indicate the impact description as well as mitigation measures proposed for each of the three alternative route alignments respectively.

Table 33: Impact description for the hydrological impacts on wetlands for the original alignment

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: • Alternative 4 is selected, as opposed to 4a for the Nerston section of the proposed line. This will minimise the impact on wetland areas in particular as alternative 4 crosses a lower number of wetlands and the crossing points are very narrow compared to alternative 4a and the original proposed alignment • 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., which if so doing alter these systems by forming impoundments.				
POST-MITIGATION				
Duration	Long-term	Mitigation can reduce the risk of lasting negative effects	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	As for pre-mitigation		
Intensity	Low - negative	Mitigation measures should be effective in reducing severity of impacts		
Probability	Fairly likely	Mitigation measures would reduce probability of impacts occuring to the extent predicted		

Table 34: Impact description for the hydrological impacts on wetlands for alternative 4

IMPACT DESCRIPTION: Hydrological impacts on wetlands (alt4)				
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: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Impact will generally be confined to specific areas		
Intensity	Low - negative	Permanent changes to the local hydrological regime are probable, the intensity of the impact in the operational phase would be low.		
Probability	Fairly likely	Due to the type of activity the potential for erosion on denuded soil exists		
MITIGATION: • Alternative 4 is selected, as opposed to 4a for the Nerston section of the proposed line. This will minimise the impact on wetland areas in particular as alternative 4 crosses a lower number of wetlands and the crossing points are very narrow compared to alternative 4a and the original proposed alignment • 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., which if so doing alter these systems by forming impoundments				
POST-MITIGATION				

Duration	Long-term	Mitigation can reduce the risk of lasting negative effects	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Very low	Mitigation measures should be effective in reducing severity of impacts		
Probability	Fairly likely	Mitigation measures would reduce probability of impacts occuring to the extent predicted		

Table 35: Impact description for the hydrological impacts on wetlands for alternative 4a

IMPACT DESCRIPTION: Hydrological impacts on wetlands (alt 4a)				
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: • Alternative 4 is selected, as opposed to 4a for the Nerston section of the proposed line. This will minimise the impact on wetland areas in particular as alternative 4 crosses a lower number of wetlands and the crossing points are very narrow compared to alternative 4a and the original proposed alignment. • 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., which if so doing alter these systems by forming impoundments				
POST-MITIGATION				
Duration	Long-term	Mitigation can reduce the risk of lasting negative effects	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	As for pre-mitigation		
Intensity	Low - negative	Mitigation measures should be effective in reducing severity of impacts		
Probability	Fairly likely	Mitigation measures would reduce probability of impacts occuring to the extent predicted		

In light of the above impact descriptions for the hydrological impact on wetlands, alternative 4 (as opposed to the original alignment and new alternative 4a) is favoured from an ecological perspective.

8.3.1.3 Biodiversity conservation

The Mpumalanga Biodiversity Conservation Plan maps biodiversity into six categories, depending on level of importance, as indicated in the text table below (Lötter and Ferrar, 2006).

Table 36: Mpumalanga Biodiversity Conservation Plan categories and descriptions

Colour code	Category and Description
	Protected Areas: Formally Protected Areas (PA) managed for biodiversity conservation and sustainable use e.g. commercial nature based tourism, education, and limited production and harvesting of wild resources, especially game animals. All PAs contribute to meeting biodiversity targets. AREA: 4.4% (+10.4% KNP).
	Irreplaceable Areas: Areas of highest biodiversity value supporting unique biodiversity features e.g. endangered species, rare habitats, which have already been severely transformed and which require protection. Developments must be controlled to ensure conservation objectives. AREA: 2.4%
	Highly Significant Areas: Very few options remain to meet biodiversity targets in these areas. Natural vegetation cover should be maintained or restored. Developments must be compatible with conservation objectives, e.g. well managed livestock grazing, small scale, biodiversity friendly. AREA: 12.3%
	Important & Necessary Areas: These areas meet biodiversity targets while minimising land use conflict. Larger areas will be required elsewhere for targets to be met, if biodiversity is lost in this category. There are options for development. Developments must be compatible with conservation objectives. AREA: 9.5%
	Least Concern: Natural areas not currently required for meeting biodiversity targets, but which contribute to functioning ecosystems and ecological connectivity. A greater variety of development choices exists in these areas. AREA: 25.2%
	No natural habitat remaining: Transformed areas e.g. urban, industrial and cultivated areas. AREA: 35.8%
	Ecological Corridors: Ecological corridors allow for long term biological movement in response to environmental change, and are located along rivers and altitudinal gradients, preferably along intact natural habitat while linking important biodiversity. Management guidelines include the maintenance of natural vegetation, minimization of natural habitat loss, and restoration of degraded habitats. Developments must be compatible with conservation objectives.

The Davel - Nerston line will traverse a number of important habitats as shown in Figure 10 of Chapter 5:

- Irreplaceable - development criteria = “linear developments are restricted”
- Highly significant – development criteria = “linear developments are restricted”
- Important or necessary (ecosystem functioning or corridors) - development criteria = “linear developments are restricted”

The remaining areas were categorised as follows:

- No Natural habitat remaining - development criteria = “linear developments are permitted”
- Least concern - development criteria = “linear developments are permitted”

8.3.1.3.1 Land use guidelines

A set of land use guidelines are recommended for each category delineated on the Mpumalanga Biodiversity Conservation Plan Map (Refer Table 37). The Railway is a Linear Engineering Structure, which is permitted within Important & Necessary Areas, Ecological Corridors and areas of Least Concern, but with restrictions to reduce the impact on biodiversity, whereas it is not permitted within Protected Areas, Irreplaceable areas and Highly Significant areas. However, it should be noted that the greater part of the proposed route follows the existing alignment.

Table 37: Recommended land use guidelines for the categories in the Mpumalanga Biodiversity Conservation Plan (Y = Yes, N = No, R = Restricted)

LAND USE	Protected Areas	IRREPLACE-ABLE	HIGHLY SIGNIFICANT	IMPORTANT & NECESSARY	ECOLOGICAL CORRIDORS	LEAST CONCERN
Conservation Management	Y	Y	Y	Y	Y	Y
Extensive Game Farming	Y	Y	Y	Y	Y	Y
Extensive Livestock Production	R	Y	Y	Y	Y	Y
Rural Recreational Development	N	N	R	R	R	Y
Rural Communal Settlement	N	N	R	R	R	R
Dryland Crop Cultivation	N	N	N	N	R	Y
Intensive Animal Farming	N	N	N	N	R	Y
Irrigated Crop Cultivation	N	N	N	N	R	Y
Timber Production	N	N	N	N	R	Y
Urban & Business development	N	N	N	N	N	R
Major Development Projects	N	N	N	N	N	Y
Linear Engineering Structures	**N**	**N**	**N**	**R**	**R**	**R**
Water Projects & Transfers	N	N	R	R	R	R
Underground Mining	N	N	R	R	R	N
Surface Mining, Dumping & Dredging	N	N	N	N	R	R

8.3.1.3.2 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.

Figure 26: An example of an elevated culvert that has raised the level of the riverbed resulting in a form of habitat fragmentation.

Significance of impact with mitigation

With the above mitigation measures in place, the definite impact on the fragmentation would remain within the Local area, resulting in a long-term impact of Medium and Low magnitudes (without and with mitigation respectively) for the operational phase, resulting in a High (without mitigation) and Moderate (with mitigation) significance. This is assuming that the proposed infrastructure will allow for culverts in suitable areas to maintain links within the aquatic and terrestrial environment.

The table below describes the impact of the potential loss of corridors and habitat fragmentation and the proposed mitigation measures, representative of all three route alignments.

Table 38: Impact description of the loss of corridors and habitat fragmentation

IMPACT DESCRIPTION: Loss of corridors and habitat fragmentation				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	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.	Consequence: Moderately detrimental	Significance: High - negative

Extent	Local	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		
Intensity	Moderate - negative	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.		
Probability	Certain	Due to the nature of the activity it will have a definate impact on the corridors of movement resulting in fragmentation		
MITIGATION: • Wetland and floodline areas 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 (Figure 2). • Construction activities should not exceed the proposed construction boundaries by more than 15 m 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.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	With the implemetation of the proposed mitigating measures the impact on fragmentation would remain in the local sphere		
Intensity	Low - negative	The porposed mitigation will reduce impacts to some extent		
Probability	Certain	Mitigation will reduce the risk of these impacts to some extent		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the railway line will be constructed adjacent to the existing line, 15 m 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 EMPr 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 75 m. Should additional space be needed for the temporary storage of material, the ECO must advise on an appropriate area away from any sensitive areas**.

8.3.1.3.3 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 wetland areas are retained and allowed to function, as a number of protected species listed by the Mpumalanga Nature Conservation Act (Act 10 of 1998) do occur within the region. Similarly it has also been indicated the a small population of *Euphorbia clavaroides* is found in servitude access on the farms Uitzicht & Tweefontein in close proximity to Davel – Hendrina road. The land owners have suggested that this access be relocated in order to protect the known specimens.

Significance of impact with 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 together with the proposed mitigations both the magnitude and significance of the impact would be Low. The impact 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 39: 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	The impact would be rated as a regional impact due to the species under consideration and the lack of potential habitat still remaining.		
Intensity	Low - negative	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, In view of the unlikely probability of finding such species 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:

- 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. The floodplain / wetlands habitats identified within the development footprint should be retained in its current state in order to prevent complete removal/destruction of the floodplain/wetland
- 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. Applications must be submitted to the Department of Agricultural, Fisheries and Forestry (DAFF) and the Provincial Department of the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET).
- 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: Low - negative
Extent	Regional	As per pre-mitigation		
Intensity	Low - negative	As per pre-mitigation		
Probability	Unlikely	As per pre-mitigation		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the railway line will be constructed adjacent to the existing line, 15 m 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 EMPr 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 75 m. Should additional space be needed for the temporary storage of material, the ECO must advise on an appropriate area away from any sensitive areas**.

8.3.1.3.4 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 *Acacia mearnsii, Pinus* and *Eucalyptus* stands for example.

Significance of impact with 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 40: 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	Long-term	As for pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Very low	Mitigation measures will reduce the potential spread of alien species and natural re-vegetaion can take place		
Probability	Fairly likely	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.		

8.3.1.4 Conclusions and recommendations of the ecological assessment undertaken

The results, based on the available information and the site investigations, show that the proposed Davel to Nerston line could impact on a number of sensitive and / or important terrestrial and aquatic habitats. However several of the metadata sources (Ferrar & Lötter, 2007) 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.

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 together with the following aspects that must be included as well as submission of the requisite Water Use License Applications (WULA) to the Department of Water Affairs:

Compilation and implementation of a Construction Environmental Management Programme (CEMPR), 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:
  - (i) to prevent accidental leakage of pollutants e.g. oil, fuel, cement,
  - (ii) 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,
  - (iii) 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
  - (iv) 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 CEMPR and the Record of Decision (Environmental Authorisation).

From an ecological perspective it is clear from the impact assessment conducted that route alternative 4 is the preferred alternative for the project.

8.3.2 Hydrology assessment

The section of the line to be upgraded (Davel to Lothair) is located in part on the watershed of the Olifants and the Vaal catchments which limits the river crossings. The section crosses the Vaal River once and is close to a series of pans.

The new alignment from Lothair to Nerston crosses the Usuthu River three times. These three crossing are downstream of Westoe Dam and the flow at these sites is controlled by the releases and flood spills from the dam.

The catchments in the study area are situated in an early summer rainfall region. The mean annual precipitation is within a range of 600 to 1000 mm (Figure 27) and the catchment runoff is between 50 and 200 mm (Figure 28). 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 main soil types in the study area are Sandy Loam, Sandy Clay Loam and Sandy Clay (Figure 29). The land use in the study area is predominately agriculture related and includes subsistence agricultural, plantations and commercial maize production (Figure 31).

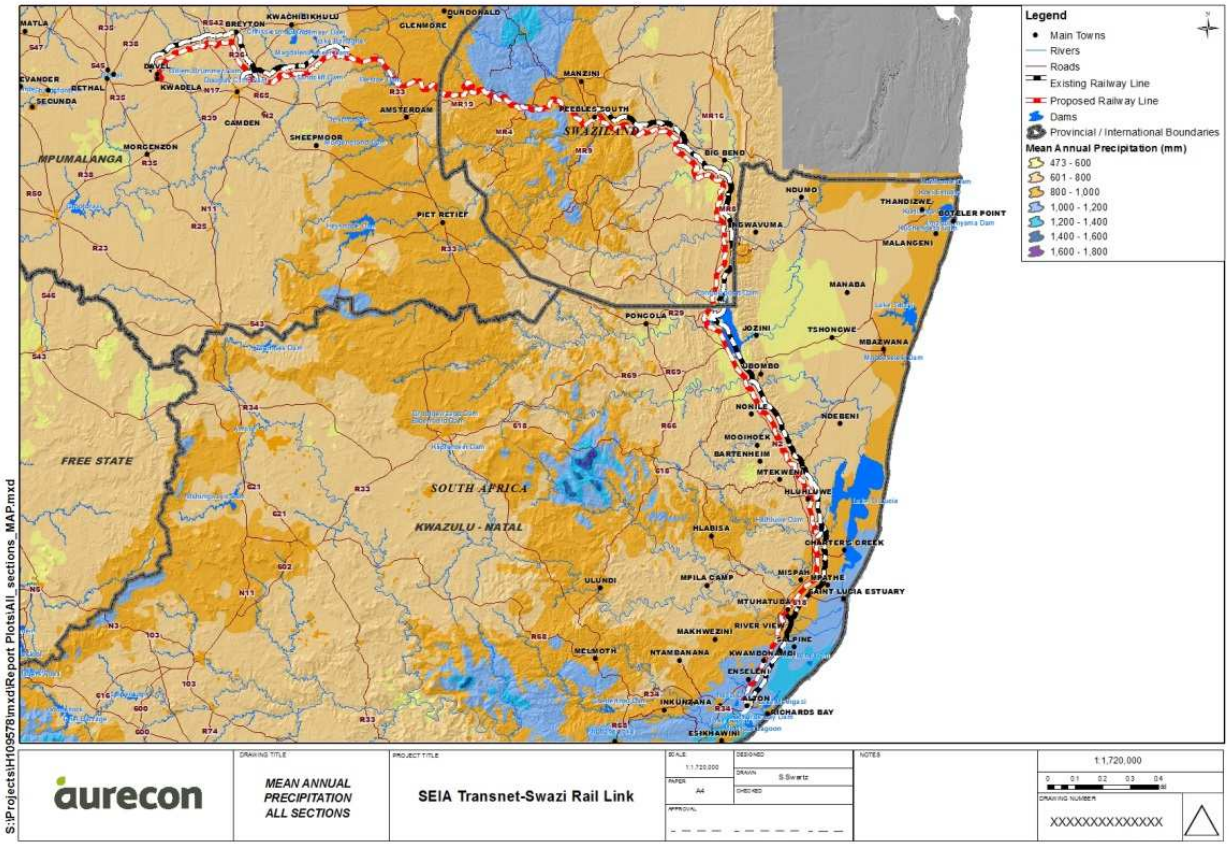

Figure 27: Mean Annual Precipitation (mm) for all sections of the Transnet Swazi Rail Link

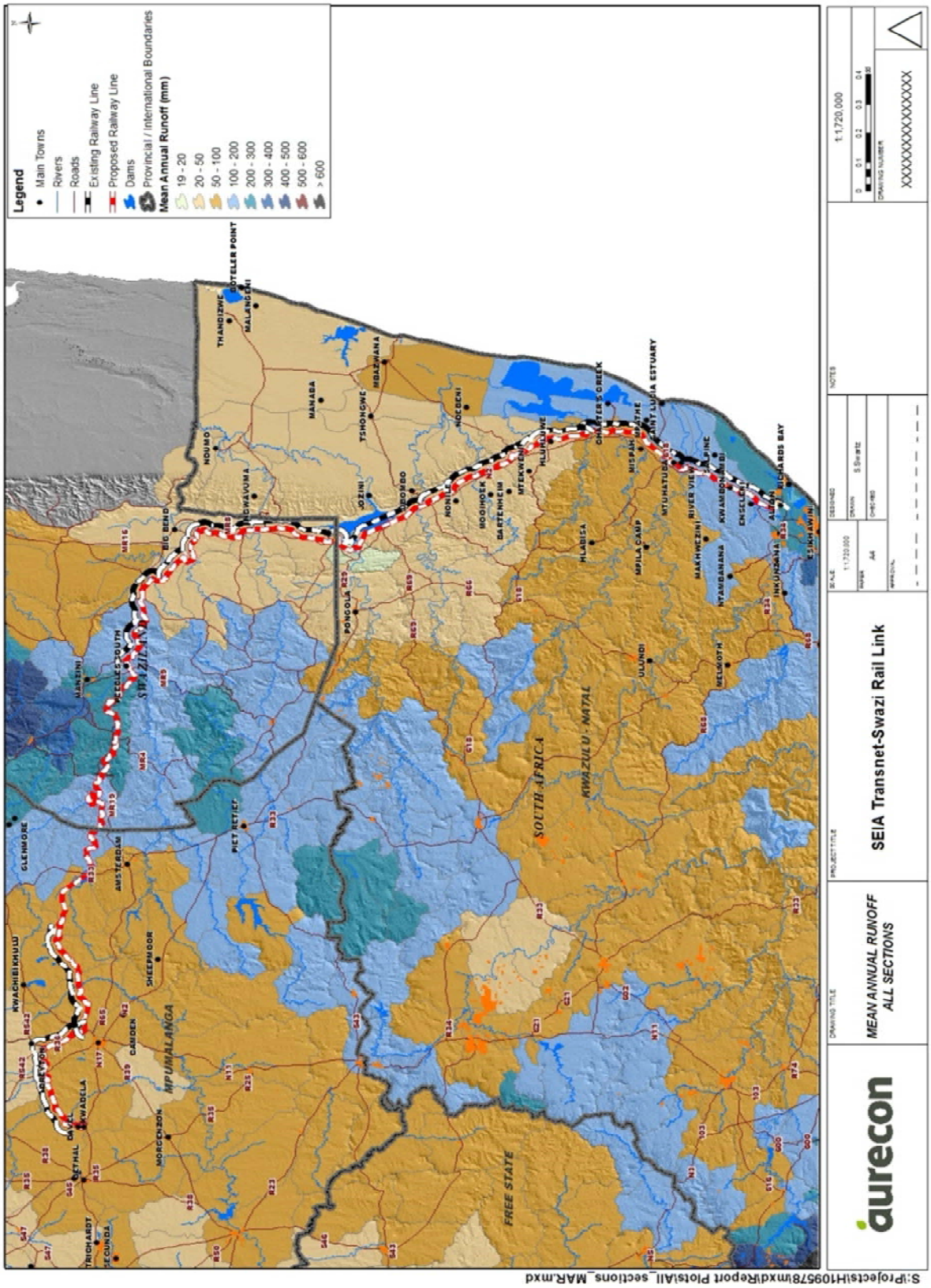

Figure 28: Runoff (mm) for all sections of the Transnet Swazi Rail Link

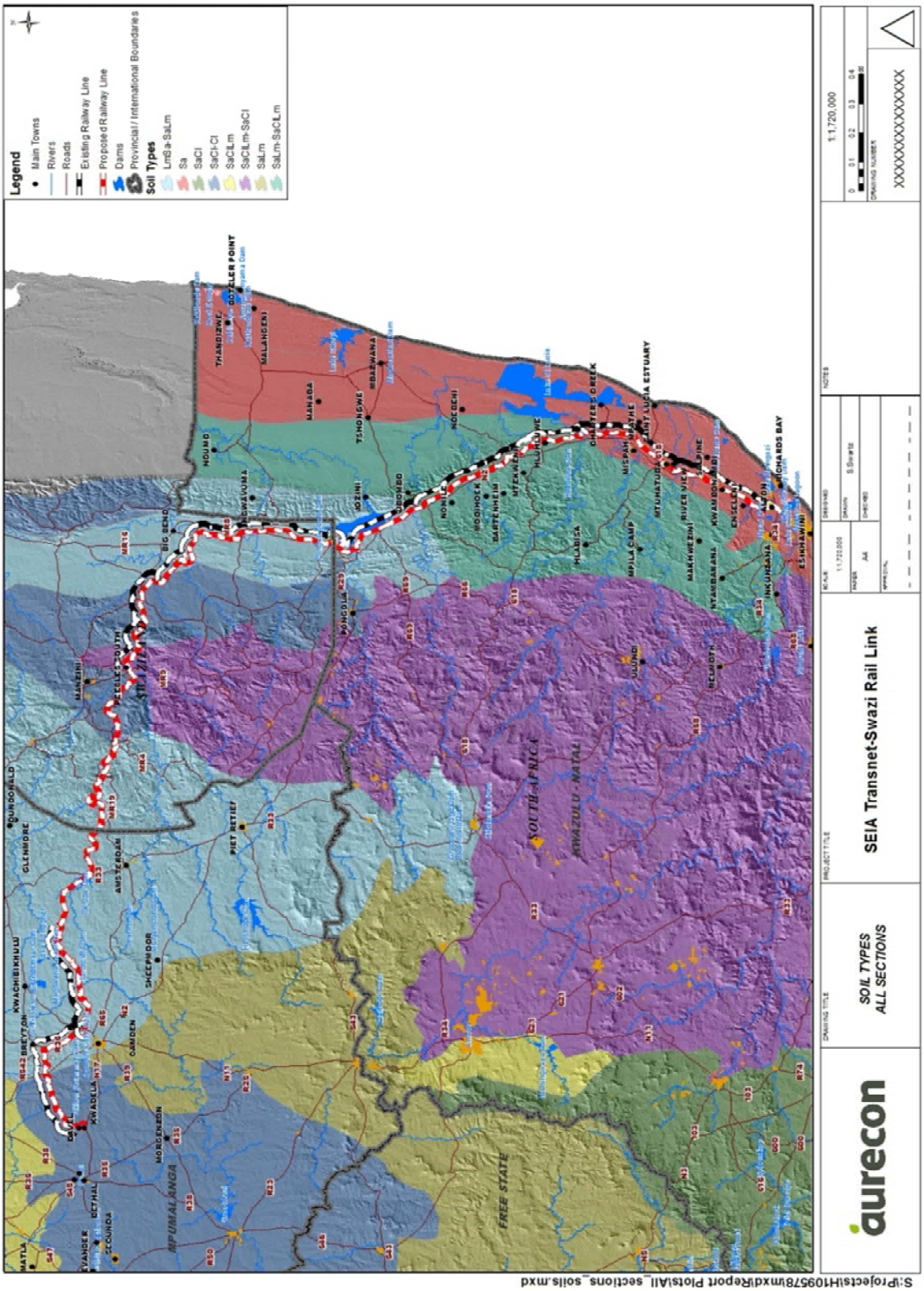

Figure 29: Soil types for all sections of the Transnet Swazi Rail Link

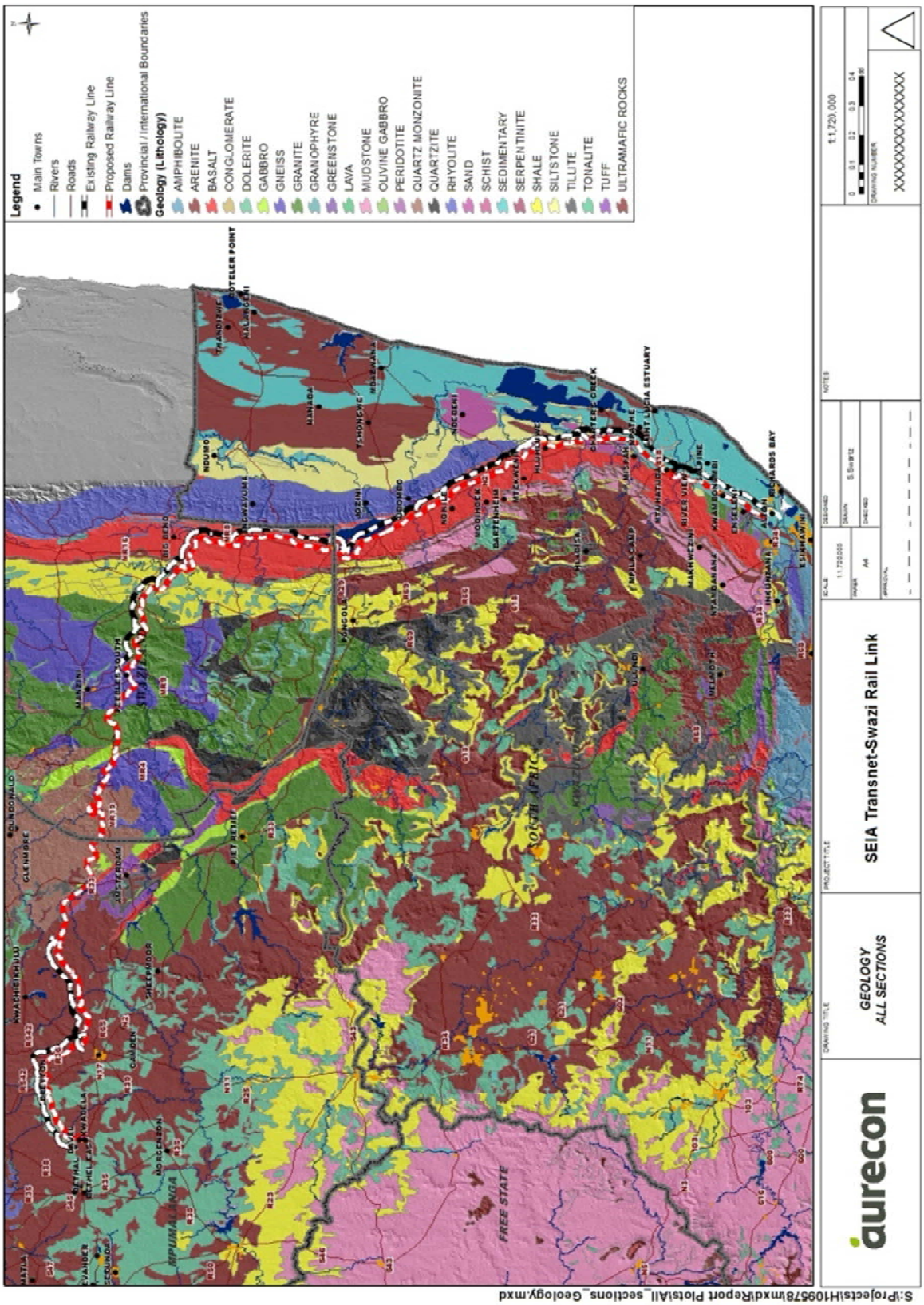

Figure 30: Geology for all sections of the Transnet Swazi Rail Link

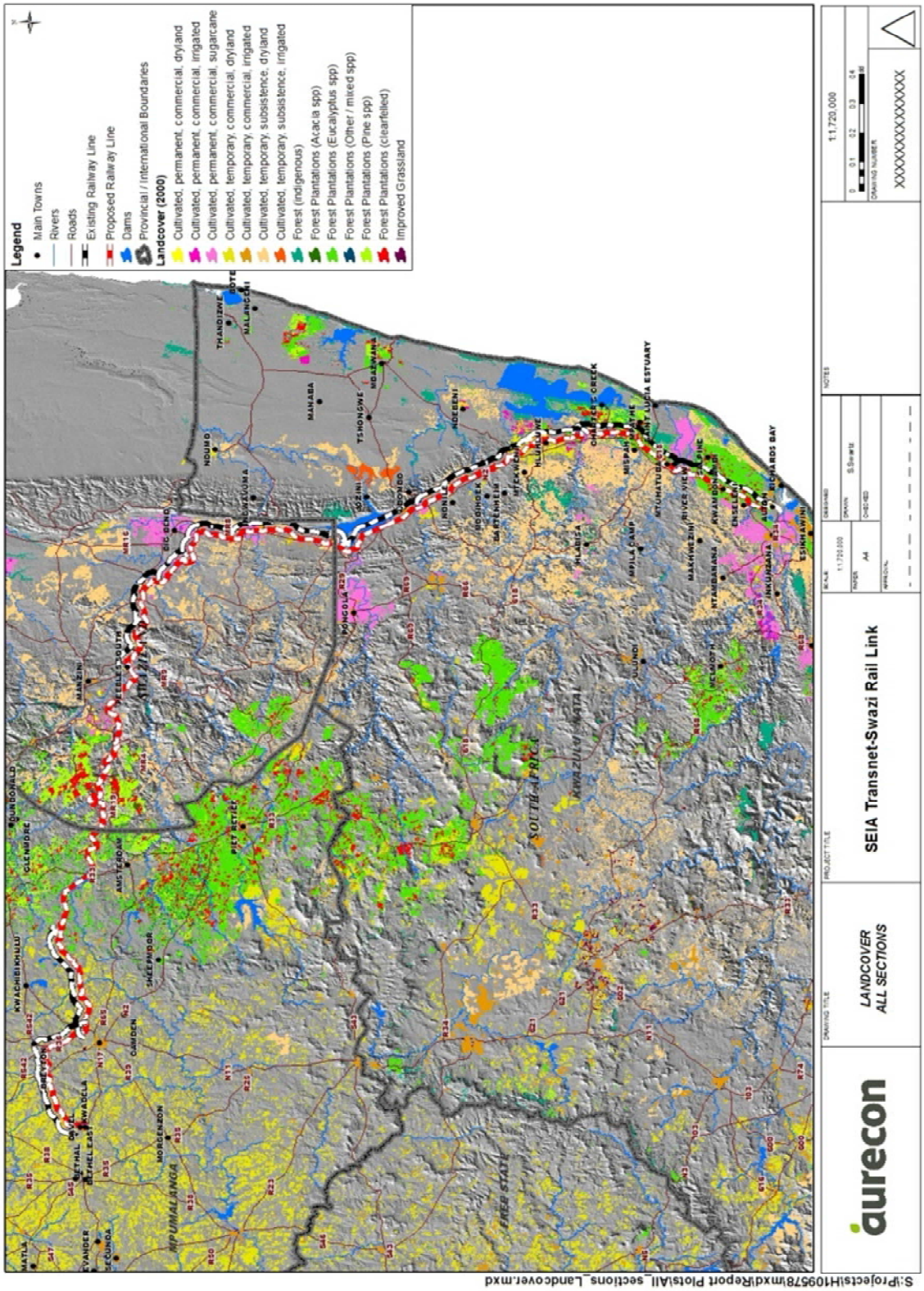

Figure 31: Land cover for all sections of the Transnet Swazi Rail Link

8.3.2.1 Water quality impact assessment

In terms of water quality impacts of the railway line, there are three concerns. The impact descriptions can be found at the end of Chapter 8.3.2:

1. The first is the accumulation of coal dust along the railway line and the impacts this may have on water quality in local streams and rivers. The water quality impacts may include an increase in the amount of dissolved salts in wash-off from the affected area, and a possible change in the pH of the water. However, it is estimated that these impacts would probably be minor and would only be manifested during the rainy season and rainfall events that generate runoff. There might be first flush effect at the onset of the rainfall season but there would probably be sufficient dilution during that time to minimise any water quality impacts. Coal dust in small quantities is relatively innocuous when mixed in water. Impurities in the coal such as sulphides may become mobilised when mixed with water and chemical reactions may create sulphates that are readily soluble in water. Particularly high volumes of sulphates need to enter the rivers to raise sulphate concentrations to levels where it can be harmful to humans, livestock and aquatic life. Golder Associates undertook an environmental impact assessment of transporting coal by rail to a power station in South Africa (Golder Associates, 2004). As part of the study they investigated the water quality impacts of the Richards Bay Coal Transport Line that transports coal from the Highveld coalfields to the coal export harbour at Richards Bay, South Africa. This line has been in operation since 1976. On this line coal is transported using both sealed wagons and bottom dumping wagons. They found no obvious signs of coal dust pollution, land owners confirmed that there did not appear to be any detrimental impacts as a result of coal dust, and an examination of soil and vegetation samples near the railway line did not show signs of coal dust pollution. They also investigated the impacts of coal falling from wagons and found minor evidence of coal falling on the area adjacent to the ballast. It was concluded that this coal fell from side-dumping wagons that did not seal well resulting in small pieces of coal falling through the small openings between the flaps. A comparison of water quality in farm dams upstream and downstream of the railway line found no difference in water quality and it was concluded that the railway line had a negligible effect on water quality (Golder Associates, 2004).

2. The second concern is seepage of rain water from uncovered wagons during the rainfall season. The limited contact time between the rainwater and the coal could lead to a minor increase in dissolved salts in the seepage water. However, there would probably be sufficient rainfall runoff and dilution in the surrounding area during such events to minimise any water quality impacts. It is also a linear impact, that is, the impact is distributed linearly along the length of the railway line.

3. The third concern is smothering of in-stream aquatic habitats with coal dust. In this case aquatic habitat refers to the substrate where aquatic biota occurs and it includes the mosaic of bedrock, cobbles, vegetation, sand, gravel and mud that make up a stream habitat. Large volumes of coal dust have the potential of smothering aquatic habitats, impacting negatively on the biota. However, no evidence of habitat smothering was found along the Richards Bay coal transport line.

8.3.2.2 Hydrological impact assessment and mitigation

8.3.2.2.1 Watercourse crossings

The major crossing that were identified as potential sites of concern and requiring a field assessment are presented in Figure 32 and listed in Table 41 along with information relating to the Quaternary Catchment in which the crossing is located. This section includes the field assessment and impact rating for the watercourse crossings.

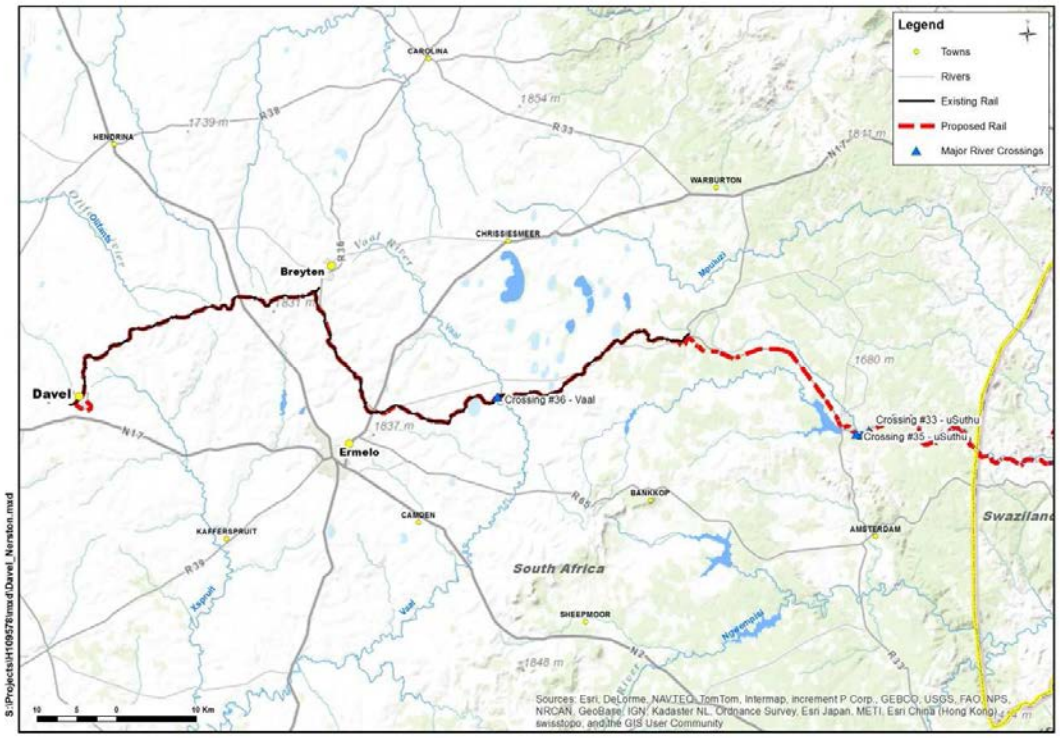

Figure 32: Major river crossings for Davel to Nerston

Table 41: Major watercourse crossings and quarternary catchment information

Crossing No	Lat	Long	River Name	Quat number	Quat MAP (mm)	Quat Runoff (mm)
33	26°30'18.50" S	30°39'40.16" E	Usuthu	W54D	896	18
34	26°30'34.54" S	30°39'10.20" E	Usuthu	W54D	896	18
35	26°30'31.35" S	30°38'44.20" E	Usuthu	W54D	896	18
36	26°27'29.13" S	30°11'35.44" E	Vaal	C11A	743	50

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 FEl-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.

The crossings listed in Table 41 will be discussed in more detail below.

Crossing 33: Usuthu River, Mpumalanga.

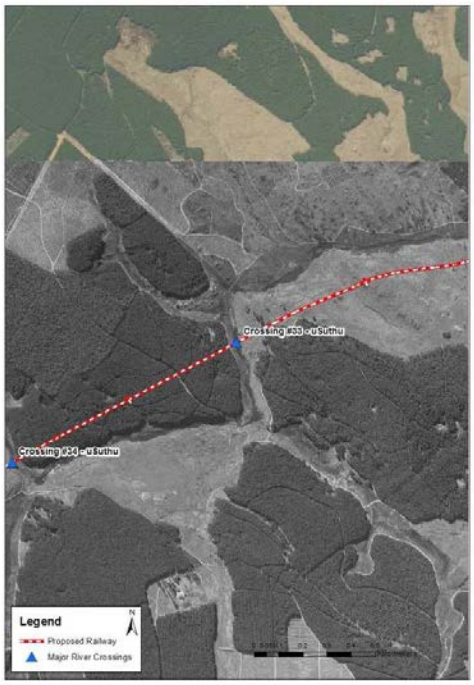

Figure 33: Aerial view of the Usuthu crossing no 33

The Usuthu River crossing (Crossing 33) is 4.5 km downstream of Westoe Dam (Figure 33) with forestry being the main land use. The Usuthu is a perennial river with high flows in summer months. The river banks are relatively stable due to bedrock outcrop in the river bed. The river flow is controlled for the most part by the upstream Dam.

This crossing is part of the new line and impacts will mainly result from disturbance and changes in the flow regime. Impacts during the construction phase include the mobilisation 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 34: Usuthu River / Westoe Dam #1, Mpumalanga

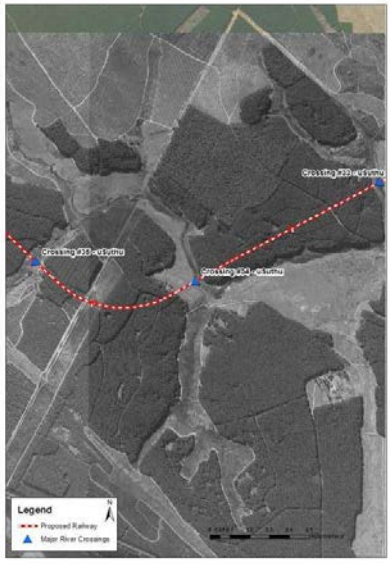

Figure 34: Aerial view (left) and actual view of the proposed railway cross-section of crossing 34

The Usuthu River crossing (Crossing 34) is 3.3 km downstream of Westoe Dam (Figure 34 left) with forestry being the main land use. The Usuthu is a perennial river with high flows in summer months. The river banks are relatively stable due to bedrock outcrop in the river bed (Figure 34 right). The river flow is controlled for the most part by the upstream Dam. Upstream of the crossing is the confluence of the Usuthu River and Bonnie Brook. Although the high flows are controlled by the Westoe Dam a flood peak of 178 m^3/s was recorded in December 1960 on the Bonnie Brook close to the confluence.

This crossing is part of the new line and impacts will mainly result from disturbance and changes in the flow regime. Impacts during the construction phase include the mobilisation 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 35: Usuthu River / Westoe Dam #2

The Usuthu River crossing (Crossing 34) is 1.8 km downstream of Westoe Dam (Figure 35) with forestry being the main land use. The Usuthu is a perennial river with high flows in summer months. The river banks are relatively stable due to bedrock outcrop in the river bed (Figure 37 and Figure 38). The river flow is controlled for the most part by the upstream Dam.

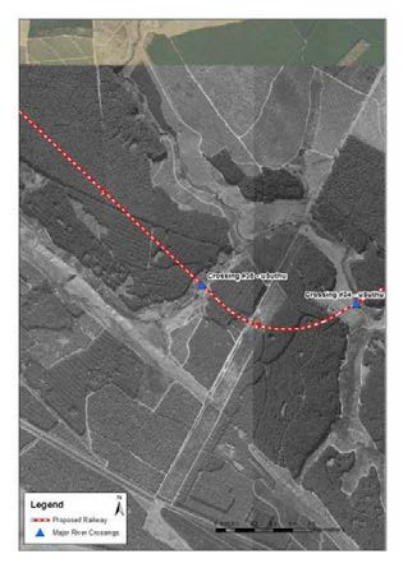

Figure 35: Aerial view crossing 35

Figure 36: View of proposed railway cross-section

Figure 37: Looking upstream Usuthu crossing

Figure 38: Looking downstream Usuthu crossing

This crossing is part of the new line and impacts will mainly result from disturbance and changes in the flow regime. Impacts during the construction phase include the mobilisation 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 36: Vaal River / Burgerspan, Mpumalanga

Figure 39: Aerial view crossing 36

Figure 40: View of railway cross-section

Figure 41: Looking upstream Vaal crossing

Figure 42: Looking downstream Vaal crossing

In an area northeast of Ermelo, the railway line crosses an agricultural region with several pans. The Upper Vaal is a perennial river and is on the existing alignment. Crossing 36 has banks that are highly eroded by both cattle and high flows (Figure 42). There are signs of flooding during around the bridge. A small stretch has been stabilised with rock gabions. Some of the erosion appears to have been caused by the culverts on the access road crossing.

Burgerspan (Figure 43) is 2.5 km west of the Upper Vaal crossing and the new rail alignment will be in places less than 50 m from the pan. Best practice culvert design needs to be followed to provide good drainage and prevent erosion.

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.

Figure 43: Burgerspan

The tables below describe the predicted impacts and their respective mitigation measures for proposed route alternatives respectively. Take note that the route alternative 4 and 4a include the original proposed route from Davel through to Westoe Dam where 4 and 4a branch off to form the new alternative alignments.

Table 42: Impact description for the potential disturbance, introduction of sediments and the erosion of banks or channels for the original alternative

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 on water quality where there water abstractions close to the watercourse crossing as well at those crossings that are upstream of nature reserves or dams		
Intensity	Low - negative	As the existing conditions show signs of high erosion and sedimentation the additional impact significance associated with the construction of bridges and culverts are predicted to be low without mitigation.		
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	Improved housing will constitute a significant benefit		
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 43: Impact description for the potential disturbance, introduction of sediments and the erosion of banks or channels for alternative 4

IMPACT DESCRIPTION: Disturbance, introduction of sediments or erosion of banks or channel (alt4)				
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	Consequence: Negligible	Significance: Very low

		naturally stabilise with time		
Extent	Local	Impact on water quality where there water abstractions close to the watercourse crossing as well at those crossings that are upstream of nature reserves or dams		
Intensity	Very low	As the existing conditions show signs of high erosion and sedimentation the additional impact significance associated with the construction of bridges and culverts are predicted to be very low without mitigation.		
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	Improved housing will constitute a significant benefit		
Probability	Fairly likely	Due to the construction activity the probability of this impact is fairly likely, however, the potential impact will be reduced by the mitigation measures		

Table 44: Impact description for the potential disturbance, introduction of sediments and the erosion of banks or channels for alternative 4a

IMPACT DESCRIPTION: Disturbance, introduction of sediments or erosion of banks or channel (alt4a)				
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	Consequence: Negligible	Significance: Very low

		once construction is finalised. Erosion to banks is possible during construction and will naturally stabilise with time		
Extent	Local	Impact on water quality where there water abstractions close to the watercourse crossing as well at those crossings that are upstream of nature reserves or dams		
Intensity	Very low	As the existing conditions show signs of high erosion and sedimentation the additional impact significance associated with the construction of bridges and culverts are predicted to be very low without mitigation.		
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	Improved housing will constitute a significant benefit		
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		

As can be seen in the comparison between the original proposed route and the alternatives 4 and 4a, both 4 and 4a are preferred in terms of the impact description. As alternative 4 has a lower number of wetland crossings, alternative 4 is viewed as the preferred route option.

Table 45: Impact description for the potential change in flow regime for the original alternative

IMPACT DESCRIPTION: Change in flow regime				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				

Duration	Long-term	As permanent structures will be placed in watercourses, the duration is seen as long term.	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	The structures are immobile and will not likely change once they have been installed, thus the extent is local.		
Intensity	Low - negative	Once the construction activities have been completed, the flow regime will settle around the bridge and culvert structures resulting in a low intensity.		
Probability	Fairly likely			
MITIGATION: • In order to mitigate an increase in flow velocity, a structure to dissipate the energy maybe required. • Best practice culvert and bridge design practices to be followed to provide good drainage and prevent erosion and sediment mobilisation. • Natural weirs and small lakes must be preserved as far as practicable.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Site-specific	With the suggested mitigation measures the extent of the impact will be reduced to site specific.		
Intensity	Very low	With the suggested mitigation measures the probability of the intensity of the impact will be reduced.		
Probability	Unlikely	With the suggeted mitigation measures the probability of impact on the flow regime will be unlikely.		

Table 46: Impact description for the potential change in flow regime for alternative 4

IMPACT DESCRIPTION: Change in flow regime (alt4)				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	As permanent structures will be placed in watercourses, the duration is seen as long term.	Consequence: Negligible	Significance: Very low
Extent	Local	The structures are immobile and will not likely change once they have been installed, thus the extent is local.		

Intensity	Very low	Once the construction activities have been completed, the flow regime will settle around the bridge and culvert structures resulting in a low intensity.		
Probability	Fairly likely			
MITIGATION: • In order to mitigate an increase in flow velocity, a structure to dissipate the energy maybe required. • Best practice culvert and bridge design practices to be followed to provide good drainage and prevent erosion and sediment mobilisation. • Natural weirs and small lakes must be preserved as far as practicable.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Site-specific	With the suggested mitigation measures the extent of the impact will be reduced to site specific.		
Intensity	Very low	With the suggested mitigation measures the probability of the intensity of the impact will be reduced.		
Probability	Unlikely	With the suggeted mitigation measures the probability of impact on the flow regime will be unlikely.		

Table 47: Impact description for the potential change in flow regime for alternative 4a

IMPACT DESCRIPTION: Change in flow regime (alt4a)				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	As permanent structures will be placed in watercourses, the duration is seen as long term.	Consequence: Negligible	Significance: Very low
Extent	Local	The structures are immobile and will not likely change once they have been installed, thus the extent is local.		
Intensity	Very low	Once the construction activities have been completed, the flow regime will settle around the bridge and culvert structures resulting in a low intensity.		
Probability	Fairly likely	It is fairly likely that this impact could occur due to the construction of crossing structures.		
MITIGATION: • In order to mitigate an increase in flow velocity, a structure to dissipate the energy maybe required. • Best practice culvert and bridge design practices to be followed to provide good drainage and prevent erosion and sediment mobilisation.				

• Natural weirs and small lakes must be preserved as far as practicable.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Site-specific	With the suggested mitigation measures the extent of the impact will be reduced to site specific.		
Intensity	Very low	With the suggested mitigation measures the probability of the intensity of the impact will be reduced.		
Probability	Unlikely	With the suggeted mitigation measures the probability of impact on the flow regime will be unlikely.		

As can be seen in the comparison between the original proposed route and the alternatives 4 and 4a, both 4 and 4a are preferred in terms of the impact description. As alternative 4 has a lower number of wetland crossings, alternative 4 is viewed as the preferred route option.

The following tables are representative of all three route alternatives.

Table 48: Impact description for predicted water abstractions, effluent discharges and animal drinking

IMPACT DESCRIPTION: Water abstractions, effluent discharges, animal drinking.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Suspended solids in the water might cause reduction in water quality during construction	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Water abstraction points downstream of construction will be affected		
Intensity	Moderate - 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: • 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				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		

Intensity	Low - negative	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		

Table 49: Impact description for the potential coal dust and railfall 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	Accumulation of coal dust along the railway line and seepage of rain water from uncovered wagons will occur throughout the lifecycle of the project	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	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		
Intensity	Low - negative	Through natural dilution the impact of such contamination will be low		
Probability	Fairly likely	Due to the nature of the project coal dust will be produced and will be washed into streams		
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	The accumulation of coal dust will be reduced through the implementation of the proposed mitigation measures		
Intensity	Very low	As for pre-mitigation, but at a reduced level		
Probability	Fairly likely	The implementation of the proposed mitigation measures will contribute towards reducing the potential intensity of the impact		

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**.

8.3.3 Air quality assessment

The objectives of the air quality impact assessment (AQIA) 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.

8.3.3.1 Emissions characterisation

Emission estimates are typically the biggest uncertainty in an AQIA. Since the overall objective of any AQIA 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.

8.3.3.1.1 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 NO_x from the vehicles and dust from the earthworks. It will also result in mainly nuisance impacts in the form of dust.

8.3.3.1.2 Operational phase of the project

Combustion of diesel results in the following emissions:

- volatile organic compounds (VOCs) and other hydrocarbons (HC);
- carbon monoxide (CO);
- nitrogen oxides (NO_x);
- particulate matter with an aerodynamic diameter smaller than 10 μg (PM10);
- particulate matter with an aerodynamic diameter smaller than 2.5 μg (PM2.5); and
- sulphur dioxide (SO_2).

The pollutants of most concern and for which there exist ambient standards in South Africa include CO, nitrogen dioxide (NO_2), PM10 and benzene (C_6H_6) (one of the HCs). Although SO_2 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 USEPA (1989). Emissions factors for different duty cycle diesel locomotives are shown in Table 50. 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 50: 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.

A detailed analysis of the proposed design capacity was done in the pre-feasibility stage. The track design allows for a train length of 2562m, 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 51: 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 AQIA. The maximum particle design capacity estimated scenario is shown in Table 52. Slight differences in train frequencies exist between the Davel to Phuzamoya and the Phuzamoya to Nsezi sections. For this AQIA, 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 52: 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	

8.3.3.2 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 AQIA, conservative estimates of operations, as well as emission factors should account for these uncertainties. The AQIA 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 53. 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 53 with the fuel estimates in Table 52 leads to total estimated annual emissions for the peak of operations (Table 54). 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 53: 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 54: 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

8.3.3.3 Baseline air quality assessment

Davel is situated in the Highveld Priority Area. As such, although not in the immediate vicinity, it is surrounded by large industrial sources. Several monitoring studies have been conducted in the area. The most recent of these were conducted in Davel/Kwadela during the 2013 months with the worst dispersion potential. These measurements are representative of the air quality around low income households. It therefore provides a perfect baseline for the current AQIA.

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, representative of all three alternative routes.

Table 55: 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		

Table 56: : 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: • 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: 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 57: 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	Very unlikely	Implementation of mitigation measures will greatly reduce the probability of the impact		

Table 58: Impact description for the contribution to ambient PM10

IMPACT DESCRIPTION: Contribution to ambient 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 59: Impact description for the contribution to ambient NO2

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 60: Impact description for the contribution to ambient C6H6

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		

8.3.4 Geohydrological assessment

For the purpose of this study, the Davel to Nerston section of the Transnet Swazi Rail Link was divided into two sections according to the geohydrological boundaries as described in the 1: 500 000 Hydrogeological Maps & accompanied explanation booklet by Barnard (2000) underlying the route. Portion 1 is located between the 0 to 67km chainages of the route, while Portion 2 is located between the 67 and 160km chainages. The physical attributes hereof are described in the table below.

Table 61: Physical geological attributes for the proposed route alignments

Chainage (km)	Hydrogeologic Unit	Geological Description	Aquifer Description	Potential Yield (l/s)
0 – 67 (Portion 1)	D2	Sandstone & Conglomerate	Fractured and Intergranular	0.1 – 0.5
67 – 160; Alternative Routes 4 and 4a (Portion 2)	D3	Sandstone, Conglomerate & Various Granitoids	Fractured and Intergranular	0.5 – 2.0

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.

Apart from the published 1:500 000 Hydrogeological Maps, a search of the National Groundwater Archive (NGA) for borehole information within the project area was conducted to characterise the geohydrological environment. A total of 212 boreholes were recorded in the region of Portion 1 of the Rail Link, while 231 boreholes were recorded in the region of Portion 2. A summary of the statistical analysis is presented in the 2 tables below.

For Portion 1 the mean groundwater level and yield for the data collected from the NGA corresponds with the figures provided by Barnard (2000) and the Hydrogeological Maps. For Portion 2 the average and mean yield as calculated from the NGA data is significantly less than described by Barnard. Only a small number of boreholes (7) had yields recorded on the NGA data base and this figure can thus not be regarded as representative of the geological unit. With regards to groundwater level data, it can be concluded that the average static water for Portion 2 is 11.68 mbgl. This corresponds with the data published by Barnard (2000).

Portion 1 (0-67km): NGA Data			
Borehole Static Water Level (SWL) Data		**Borehole Yield Data**	
No of BH with SWL data	154	No of BH with Yield Data	24
Average SWL	13.10	Average yield	0.99
Mean SWL	10.82	Mean yield	0.48
Max SWL	45.72	Max yield	5.3
Min SWL	0.07	Min yield	0.01

Portion 2 (67-160km; Alternative Routes 4 and 4a): NGA Data	
Borehole Static Water Level (SWL) Data	Borehole Yield Data

No of BH with SWL data	182	No of BH with Yield Data	7
Average SWL	11.68	Average yield	0.14
Mean SWL	9.14	Mean yield	0.08
Max SWL	60.96	Max yield	0.36
	1.07		0.01

Since the majority of Portion 1 & 2 of the Davel-Nerston section of the rail link is located in the rural areas of Mpumalanga, groundwater is mainly used for domestic purposes and stock watering. The majority of users make use of boreholes for their water requirements.

The natural groundwater quality in both portions is generally good and fit for human consumption.

From the outcome of the specialist assessment it can be seen that the construction and operational phases of the Davel to Nerston section 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. The impact description and accompanying mitigation measures can be found in the following table:

Table 62: Impact description for the potential hydrocarbon spillages.

IMPACT DESCRIPTION: 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 groundwater resources as a result of hydrocarbon runoff from contaminated poses a long term threat	Consequence: Extremely detrimental	Significance: Moderate - negative
Extent	Regional	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: * Ballast should be cleaned every 3 to 4 years by the use of a ballast cleaner * Ballast cleaning should involve the removal of worn ballast with the replacement of new ballasts * The construction of the workshops, cleaning bays and fuel dispensing areas of the construction camps 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 Response Procedures should be in place with capable people with the necessary training available at strategic locations to follow these procedures in the case of major accidents and/or accidental spillages.				
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		

The mitigation measure highlighted in red above is as proposed by the specialist. However, after consultation with the proponent, the EAP is of the opinion, based on current operations for the Sishen-Saldanha Ore line that **a cleaning cycle of at least once every 16 years be implemented during the operational phase**. This is due to the fact that while at rail yards and fuelling stations hydrocarbon spillages are likely to occur, the same happening on a running railway line is unlikely. Undergoing costs of cleaning ballast every 3-4 years is an unwarranted cost and this mitigation measure is thus not included as part of the impact assessment, i.e. **the significance of the impact post mitigation remains very low**.

Table 63: Impact description for the potential of waste leakages / spillages in the construction camps

IMPACT DESCRIPTION: 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 aquifers poses a long term threat	Consequence: Extremely detrimental	Significance: Moderate - negative
Extent	Regional	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 64: Impact description for the incorrect disposal of hazardous and non-hazardous materials or waste

IMPACT DESCRIPTION: Incorrect disposal of hazardous and non-hazardous materials or waste could contaminate 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: Extremely detrimental	Significance: Moderate - negative
Extent	Regional	Local water resources may be contaminated resulting in contamination of aquifers		
Intensity	Very high - negative	Contamination of water resources with hazardous material could lead to health risks		
Probability	Fairly likely	Contamination of water resources by the incorrect disposal of materials is fairly likely due to the nature of the material being transported		
MITIGATION: An adequate waste management plan should be implemented to prevent incorrect disposal of materials.				
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 severly reduce the potential of contamination of water resources		

Table 65: Impact description for the potential 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 water resources could pose a long term health risk	Consequence: Extremely detrimental	Significance: Moderate - negative
Extent	Long-term	Plumes migrate off-site		
Intensity	Long-term	Poses a serious health risk		
Probability	Long-term	Contamination is fairly likely due to human error		
MITIGATION: • Ballast should be cleaned every 3 to 4 years by the use of a ballast cleaner • Ballast cleaning should involve the removal of worn ballast with the replacement of new ballasts				
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		

The mitigation measure highlighted in red above is as proposed by the specialist. However, after consultation with the proponent, the EAP is of the opinion, based on current operations for the Sishen-Saldanha Ore line that **a cleaning cycle of at least once every 16 years be implemented during the operational phase**. This is due to

the fact that while at rail yards and fuelling stations hydrocarbon spillages are likely to occur, the same happening on a running railway line is unlikely. Undergoing costs of cleaning ballast every 3-4 years is an unwarranted cost and this mitigation measure is thus not included as part of the impact assessment, i.e. **the significance of the impact post mitigation remains very low**.

Table 66: Impact description for potential 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 surface water resources could have a long term impact on groundwater	Consequence: Highly detrimental	Significance: Low - negative
Extent	Medium-term	Will be restricted to local impact		
Intensity	Medium-term	Contaminated groundwater could pose a serious health risk		
Probability	Medium-term	Contamination is likely due to human error		
MITIGATION: • Emergency spill response procedures should be in place with capable people with the necessary training available at strategic locations to follow these procedures in the case of major accidents and/or accidental spillages.				
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 67: Impact description for potential wind-blown material eminating from uncovered rail trucks

IMPACT DESCRIPTION: Wind-blown material eminating 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 surface water resources could have a long term impact on groundwater	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Regional	Will be restricted to local impact		
Intensity	Moderate - negative	Contaminated groundwater could pose a serious health risk		
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: • Transnet should consider covering rail trucks when transporting hazardous materials.				

POST-MITIGATION				
Duration	Short-term	Contamination of water resources will be contained 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		

8.4 Impacts on the Physical Environment

8.4.1 Noise and vibration assessment

Measurements and site investigation were conducted from the 10th September till the 13th 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 NSD04 to NSD121. The following rating levels are proposed for receptors in the study area:

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

Four operational scenarios were assessed as the project functions, namely:

- The projected *daytime* initial peak hour assessment (worst case) when the railway initially starts operations;
- The projected *night-time* initial peak hour assessment (worst case) when the railway initially starts operations;
- The projected *daytime* future peak hour assessment (worst case) when the railway operates at maximum capacity; and
- The projected *night-time* future peak hour assessment (worst case) when the railway operates at maximum capacity.

There is no standard or guideline in South Africa stipulating the requirements to calculate or model the potential noise impacts from a railway operation. Various International propagation models do exist. The European Transportation Research Laboratory (TRL) has recommended the British model “Calculation of Railway Noise, 1995” as the most technical sound of the available models. For this reason assessment calculations were done in accordance with the sound propagation model described by British CRN (Railway Noise) model.

Assessment indicated a potential sound environment where Equator principles 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 proximity of the proposed railway line in relation to certain receptors.

The two tables below describe the impacts of the initial day and night scenario and the future day and night scenario respectively as well as their proposed mitigation measures.

Table 68: 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 the Equator Principal 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 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 69: 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 complete	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 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		

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 being of a potential high significance, mitigation options could be considered by the developer. The mitigation of noise from railway lines is difficult and potentially expensive to implement. Mitigation discussed below is optional and not mandatory for the developer due to the exemptions mentioned above. Mitigation options should be considered at receptors where a medium to high potential for a noise impact has been identified (refer to Appendices in document) receptors that are near where trains have to brake and/or receptors that border or are adjacent to the railway line. Mitigation options should also be considered at potential sensitive areas such as places of worship (religious), at educational and health care facilities and at business that cater for hospitality (game lodges).

<u>Mitigation Options: Mitigation of Noise Source – Railway Line</u>

Possibly the best mitigation options when considering acoustics is the design and specifications of railway lines and operations. These include:

1. *Minimise train operations during the night-times (22:00 – 06:00, SANS 10103:2008)* - The potential important times for a noise annoyance to occur would be during the night-time hours when a quiet environment is desired (at night for sleeping etc.). It is highly likely that maximum noise levels due to single noise events outdoor at houses (directly adjacent to the train) could exceed 80 dBA. This would be also relevant during

religious worship, at educational and health care facilities and at business that cater for hospitality (e.g. pray times at the Mosque or Sunday church services and at game lodges).The developer should consider identifying such sensitive areas as mentioned above and discussing the findings of this report with them. **However, as the railway line is a 24 hour operation, this mitigation measure is considered impractical and unfeasible and will therefore not be implemented by Transnet.** ;

2. *Programmes to manage rail and wheel roughness* – The developer can consider the implementation of composite material (or similar) brake shoes ("K or LL Blocks") as cast-iron brakes cause wheel roughness (and more friction and noise). These wheel dampers will produce the lowest peak noise levels, but may not prevent tyre squeal fully. The LL brake block system has the potential to reduce rolling and braking noises over cast iron brakes as well as K blocks. LL block systems does not require the adaption of cast-iron brake systems and also damage the train wheels far less than a conventional cast-iron brake. The developer should consider ensuring that rail head grinding and rail head maintenance is conducted regularly to ensure that the correct rail head profile is maintained. The developer could consider rail dampers on the rail line at sections of rail near receptors dwellings;
3. *Consideration into 40 km/h train speeds near sensitive areas* – If the developer operates at slower speeds (not maximum) near sensitive areas, this would minimise a potential noise annoyance near places of religious worship, at educational and health care facilities and at business that cater for hospitality (game lodges);
4. *Screen the line of sight from receptors to the rail loops and railway lines* – The developer can consider berms, barriers and design of the rail loop infrastructure (placement of buildings at rail loops) in order to screen the railway line operations to a receptors dwellings. From a technical perspective it would seem easiest to consider a berm or single/double brick wall. A less feasible option (from a technical perspective) is to design the railway loops and railway line to be at a lower elevation than a receptors dwelling (sufficient height difference to obscure line of sight). Advancement in barriers designed specifically for sound insulation has improved drastically over the years. Although a more expensive option than single/double brick/concrete wall or an aggregate berm, acoustic barriers are specifically designed as a buffer for noises. Such barriers could be implemented along the railway line where there is a potential for a high noise impact or at sensitive areas. If the developer decides to implement a double brick wall or berm, the following factors should be implemented to ensure an effective noise boundary wall/barrier:
    - It is recommended that the barrier be built as close as possible to the footprint of the railway line (noise source) or residents (receptor) as is feasible as possible. The barrier design needs to consider diffraction, and should have no aperture or gaps;
    - It is recommended that the height of the berms/barriers be at least 1 m higher than the line of sight to the highest noise source from the railway line to a receptors dwelling. Barriers must also be sufficiently dense (at least 20 kilograms/square meter surface density) and sufficient in thickness. A brick wall provides a surface density of 244 kilograms/square m at thickness of 150 mm[1]and is considered as a typically good acoustical barrier. Certain metrological conditions (particularly during night-times) can see refraction of noise over the barrier due to the various temperature inversion layers. This means that noise levels from a

railway line may propagate back down to the ground at a receptors dwelling due to the curvature of sound in the warmer upper night-time atmosphere. Barrier height cannot effect this propagation; and

- The barrier should be sufficiently long.

Mitigation Options: Mitigation at Receptors

The following optional possibility can be considered by the developer:

1. *Relocate receptor* – An option for the developer to consider relocating receptors directly adjacent to the proposed railway line.

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. *Religious, health, educational buildings and hospitality facilities* – The developer could consider identifying these facilities near the railway line and co-ordinating any operational times that may be sensitive to these receptors.

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.

The findings of this report should be made available to all identified potentially noise-sensitive developments in the area with the contents explained to them to ensure that they understand all the potential risks that the development may have on them their families or their business.

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.

8.4.2 Cultural and heritage resources assessment

The National Heritage Resources Act (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 occurrence of sites with a Grade I significance will demand that the development activities be drastically altered in order to retain these sites in their original state. For Grade II and Grade III sites, the applicable of mitigation measures would allow the development activities to continue.

Sites regarded as having low significance is viewed as recorded in full after identification and would require no further mitigation. Impact from the development would be judged to be low. Sites with a medium to high significance would require mitigation. Mitigation, in most cases the excavation of a site, is in essence destructive and therefore the impact can be viewed as high and as permanent.

8.4.2.1 Statement of significance

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 70 indicates the summary of the heritage resources which were identified during the assessment:

Table 70: Summary of identified heritage resources

Identified heritage resources	
Category, according to 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)	None
palaeontological site or material (Section 35)	None
Graves or burial grounds (Section 36)	Yes
Public monuments or memorials (Section 37)	None
Other	

Any other heritage resources (describe)	None

8.4.2.2 Impact assessment

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

Based on current knowledge and understanding of the area, one can evaluate the heritage sites in the area as follows:

1) Old silos adjacent to the railway line and station.

   - **Dependant on the number of similar structures in the region (according to function, age and architectural features), the feature is viewed to have high significance on a regional level.**

   - Although this building has been abandoned for some time, it is still in a good state of repair. It is unclear if it would be impacted on by the proposed. 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 SARHA, application for a permit for its destruction can be applied for.

   - If there is no impact on this structure, no further action would be required.

2) Part of the old station at Estancia. Consists of two semi-detached houses. Probably used as accommodation for the station personnel. The station building, located across the track from this building, has been demolished.

   - **Dependant on the number of similar structures (according to function, age and architectural features) in the region, the feature is viewed to have medium significance on a regional level.**

   - This building is still in a good state of repair. It is unclear if it would be impacted on by the proposed. 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 SARHA, application for a permit for its destruction can be applied for.

   - If there is no impact on the station building, no further action would be required.

3) The station at Burgerspan. Although the various building have been demolished, the water tanks and water intake point is still standing. This is reminiscent of the by-gone days of steam locomotives.

   - **Dependant on the number of similar structures (according to function, age and architectural features) in the region, the feature is viewed to have high significance on a regional level.**

   - The buildings that made up this station have been demolished and vandalised. The water tanks and water point is still in a good condition. As these features 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 SARHA, application for a permit for its destruction can be applied for.

   - If there is no impact on the station building, no further action would be required.

4) The station building at Lothair. It is still in use and as a result is in a good condition.

   - **Dependant on the number of similar structures (according to function, age and architectural features) in the region, the feature is viewed to have medium significance on a regional level.**

- This building is still in a good state of repair. It is unclear if it would be impacted on by the proposed. 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 SARHA, application for a permit for its destruction can be applied for.

- If there is no impact on the station building, no further action would be required.

5) A large number of culverts built with dressed sandstone were identified on all sections of the existing line. Some of these have already being upgraded, being strengthen with concrete.

- **Dependant on the number of similar structures (according to function, age and architectural features) in the region, the feature is viewed to have medium significance on a regional level.**

- As these features are inside the railway lines, the probability that it would be impacted on

- If there is no impact on the station building, no further action would be required.

6) A three span metal truss bridge across the Vaal River has been identified. At present it is unsure when the bridge was constructed as all the name-plates have been removed, probably by collectors.

- **Dependant on the number of similar structures (according to function, age and architectural features) in the region, the feature is viewed to have high significance on a regional level.**

- In all probability this feature is older than 60 years, although it might have been upgraded in the past. As this feature is 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 SARHA, application for a permit for its destruction can be applied for.

- If there is no impact on the culverts, no further action would be required.

7) One formal cemetery has been identified. In addition six informal burial places have been identified. The latter six are all located inside or directly adjacent to the railway servitude.

- **Dependant on the number of similar features in the region, these burial places is viewed to have high significance on a local level.**

- The official cemetery is well fenced and would not be impacted on by the proposed development.

- The six informal burial places have a high risk of impact. It is recommended that they are left in place and fenced off during the upgrade/construction of the railway line. If that is impossible, they will have to be relocated after proper procedures have been followed.

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

Table 71: 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	Displacement of graves/ spiritual sites will be permanent	Consequence: Highly detrimental	Significance: Moderate - negative

Extent	Regional	Will affect graves/ spiritual sites in right-of-way		
Intensity	High - negative	Loss of graves/ spiritual sites will constitute a negative social impact and may precipitate opposition to the project		
Probability	Fairly likely	Presence of cultural resources in right-of-way was not established as part of this assignment		
MITIGATION: • Where possible, narrow the right-of-way to avoid graves/ spiritual site. • Relocation of graves/ spiritual sites to be executed in culturally appropriate manner • Accidental discovery of graves/ archaeological sites to be reported and dealt with according to relevant legislation and cultural norms				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Regional	As for pre-mitigation		
Intensity	Moderate - negative	Number of affected graves/ spiritual sites may be reduced by narrowing parts of the right-of-way		
Probability	Fairly likely	Culturally appropriate relocation will reduce the likelihood of this constituting a negative social impact		

8.5 Impacts on the Social and Socio-economic Environment

8.5.1 Social impact assessment

The 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 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:

8.5.1.1 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.

8.5.1.2 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.

The following impacts are representative of the **construction phase** of the project.

8.5.1.3 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* – 35 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 between 3 and 6 household members; and
- Stats SA indicates that a large proportion of the population in Msukaligwa Local Municipality is still *young* (30 percent under 15 years of age), and Mkhondo Local Municiplaity (36 percent under 15 years of age) and are therefore set to enter the labour market within the next few years. This will place more strain on employment, with its existing shortage of employment opportunities.

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.

Construction activities on the proposed line between Davel and Nerston will create a number of 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 associated with the creation of employment opportunities.

Table 72: Impact description for the creation of employment opportunities

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Creation of employment 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>Construction activities will create a number of temporary jobs</td><td rowspan="3">Consequence: Slightly beneficial</td><td rowspan="4">Significance: Moderate - positive</td></tr>
<tr><td>Extent</td><td>Local</td><td>Sourcing of construction workers from the local labour pool is likely to be limited to unskilled and semi-skilled workers</td></tr>
<tr><td>Intensity</td><td>Moderate - positive</td><td>In addition to creating job opportunities for construction workers, the project may also lead to indirect employment creation in the informal sector</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">Semi-skilled and unskilled jobs will be created</td></tr>
<tr><td colspan="5">MITIGATION:
Proactively manage:
• Make use of local labour as far as possible.
• Liaise with local community structures to identify local labour pool.</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: Moderate - positive</td></tr>
<tr><td>Extent</td><td>Local</td><td>As for pre-mitigation</td></tr>
<tr><td>Intensity</td><td>High - positive</td><td>By implementing the mitigation measures the local labour pool will benefit</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">The use of the local labour force will be enhanced</td></tr>
</table>

8.5.1.4 Impact assessment: BEE opportunities

Transnet sets certain targets in terms of *procurement progression* – in other words, procurement of goods and services from BEE companies. In terms of this commitment, it is likely that a significant proportion of the goods and services required for the construction phase of the project will be procured from companies owned by historically disadvantaged South Africans. In so doing, it will contribute toward black economic empowerment.

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 73: Impact description for opportunities for local sourcing of goods and services

IMPACT DESCRIPTION: BEE opportunities				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Procurement of goods and services required for the construction phase of the project from companies owned by historically disadvantaged South Africans	Consequence: Moderately beneficial	Significance: Moderate - positive
Extent	Regional	Will benefit the local economy		
Intensity	Moderate - positive	Depends on the implementation of the Transnet procurement policy		
Probability	Very likely	Depends on the implementation of the Transnet procurement policy towards achieving their procurement targets		
MITIGATION: • Include conditions in construction contract to involve and train emerging BEE companies				
POST-MITIGATION				
Duration	Long-term	By implementing the mitigation measures the duration of the impact could continue during the operational phase, albeit at a lower intensity	Consequence: Highly beneficial	Significance: High - positive
Extent	Regional	As for pre-mitigation		
Intensity	Moderate - positive	Implementation of the mitigation measures will enhance the use of local service providers and goods		
Probability	Certain	Mitigation will incease the use of appropriate service providers and goods		

8.5.1.5 Impact assessment: Influx of job seekers

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 Municipality, with an unemployment rate of more than 27% 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.

Although this impact is listed here under the heading of "Potential impacts during construction," it is possible that it may commence prior to construction, and may continue after construction has been completed. Contact between newcomers and locals could also create various social problems.

The table below describes the impact for the potential influx of job seekers as well as recommended mitigation (or maximisation) measures.

Table 74: Impact description for the influx of job seekers

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 attract unemployed people to the area during the construction phase	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Will affect local communities		
Intensity	Moderate - negative	Will affect local communities		
Probability	Very likely	In a region with high levels of unemployment this is very likely to happen		
MITIGATION: • As far as possible, make use of local labour. • Liaise with farmers, local community structures and the Local Municipality) 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	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	Very likely	Mitigation will reduce likelihood of negative consequences		

8.5.1.6 Impact assessment: Outflow of labour

Locals who secure employment with the contractors / Transnet will receive training, thereby enabling them to secure more permanent employment elsewhere after the completion of this project thereby adding to the migrant labour force.

The impact assessed before the implementation of mitigation measures mostly relates to the negative impact that can be expected as a result of the outflow of labourers from the area. These potential impacts should not only be viewed in purely negative terms, as it might also have a positive impact in terms of financial gain to families. These could lead to improved living conditions and social upliftment of the local community.

For the farmers this is a real negative impact as they will have to re-train other labourers, on farm management and this may set them back in terms of time and money. The local areas and farms will experience loss of men / women who becomes part of the migrant community. The impact of this migration becomes evident when the labourers go back home after having contracted HIV and other STIs, infect their wives and / or girlfriends. This can be viewed as a residual impact as a result of migrant work and the social pathologies associated with such work such as prostitution and alcohol abuse. Some men / women might never return home, leaving behind vulnerable families who live in poverty.

Construction workers who leave the area will not necessarily be available to work on future projects in the area and this may lead to influx of other construction workers / job seekers (bringing other associated impacts) into the area.

The table below describes the impact for the potential outflow of labour as well as recommended mitigation (or maximisation) measures.

Table 75: Impact description for the outflow of labour

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Outflow of labour</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>Medium-term</td><td>Trained workers would become more marketable elsewhere after the completion of this project thereby adding to the migrant labour force</td><td rowspan="3">Consequence: Moderately detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>Will affect local communities</td></tr>
<tr><td>Intensity</td><td>Moderate - negative</td><td>Outflow of trained workers could have a negative impact but would also create opportunities for other workers and will potentially increase the economic inflow to the community.</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Job opportunities for trained workers outside the study area is likely to happen</td></tr>
<tr><td colspan="5">MITIGATION:
• Develop skills transfer plans that would enable a worker to move from one project to another within the same area / region.
• Implement methods to create HIV and STI awareness amongst construction workers and communities.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Medium-term</td><td>Implementation of mitigation measures could alleviate the need for trained workers to leave the area</td><td rowspan="3">Consequence: Slightly detrimental</td><td rowspan="3">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 will reduce the need for trained workers to leave the area</td></tr>
</table>

Probability	Fairly likely	Mitigation could reduce the outflow of trained workers from the area	

8.5.1.7 Impact assessment: Creation of 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 expansion project. Therefore, this expansion in informal settlements is the result of many cumulative impacts, such as influences of other mines 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 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;
- Local Municipality;
- Farmers Association;
- 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 for the potential creation of informal settlements as well as recommended mitigation (or maximisation) measures.

Table 76: Impact description for the creation of informal settlements

IMPACT DESCRIPTION: Creation of informal settlements				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	The establishment of informal settlements by caused by the influx of workers could occur during the construction phase	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Regional	Informal settlements are usually associated with an increase in social pathologies which could manifest itself on a wider regional scale		
Intensity	Low - negative	Informal settlements are often associated with negative social problems		
Probability	Fairly likely	The expected influx of job seekers, the high unemployment rate and lack of sufficient housing will in all probability lead to the establishment of informal settlements		
MITIGATION:				
• Facilitate the establishment of a "Community Safety Committee" to monitor and control illegal squatting. <u>Committee to consist of:</u> - The Community Relations Department of Transnet; - Its counterparts at other mines in the area; - The Local Municipality; - Farmers Association; - Local landowners; - Representatives of local community structures; and - 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 completed - Establishment of construction camps			
POST-MITIGATION				
Duration	Short-term	The implementation of the mitigation measures will reduce and manage the establishment of informal settlements	Consequence: Negligible	Significance: Very low
Extent	Local	Mitigation could contain the impact to the local level		
Intensity	Very low	Mitigation could reduce severity of impact		

Probability	Fairly likely	Mitigation could reduce likelihood of impact occurring to the intensity predicted	

8.5.1.8 Impact assessment: Social pathologies arising from population influx

It is assumed that the construction workforce for the proposed line 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.

An influx of construction workers and job seekers might be accompanied by an increase in crime. 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.

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 77: Impact description for possible social pathologies arising from population influx

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Social pathologies arising from population influx</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>Medium-term</td><td>Influx of job seekers during the construction phase could lead to conflict between locals and newcomers</td><td rowspan="3">Consequence: Slightly detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>Will affect local communities</td></tr>
<tr><td>Intensity</td><td>Low - negative</td><td>Conflict between locals and newcomers could occur.</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Local communities frequently, rightly or wrongly, associate newcomers with social problems</td></tr>
<tr><td colspan="5">MITIGATION:
Additional security must be provided during this period by the contractors, which should be integrated with existing farm /community security systems
Implement HIV/AIDS and alcohol abuse campaigns in the communities
Align awareness campaigns with those of other organisations in the area (i.e. the local municipality, farmers etc.)</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Medium-term</td><td>Management of the issue could reduce the impact to a short term impact</td><td rowspan="3">Consequence: Negligible</td><td rowspan="3">Significance: Very low</td></tr>
<tr><td>Extent</td><td>Local</td><td>Impact could be reduced</td></tr>
<tr><td>Intensity</td><td>Very low</td><td>Occurrence of the impact could be reduced by mitigation process</td></tr>
</table>

Probability	Fairly likely	Even with mitigation potential still exists, albeit at a lower intensity	

8.5.1.9 Impact assessment: Increase in crime levels

Once 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.

During the household survey, respondents mentioned that they are already experiencing a rapid increase in crime levels. In addition, the interviews with farmers also brought to light the issue of safety and security, as was experienced during the previous projects in the area. They recommended that Transnet should assist farmers and the community to provide additional safety at night.

The table below describes the impact which could arise due to possible increase in crime levels as well as recommended mitigation (or maximisation) measures.

Table 78: Impact description for the increase in crime levels

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Increase in crime levels</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>Medium-term</td><td>Influx of workers and job seekers could result in an increase in crime</td><td rowspan="3">Consequence: Slightly detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>Local communities will be affected</td></tr>
<tr><td>Intensity</td><td>Low - negative</td><td></td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Increase in population numbers and low levels of employment in confined areas could potentially lead to an increase in crime</td></tr>
<tr><td colspan="5">MITIGATION:
Additional security must be provided during this period by the contractors, which should be integrated with existing community security systems
Implement crime awareness campaigns in the communities
Align awareness campaigns with those of other organisations in the area (i.e. the local municipality etc.)
Construction workers should be clearly identifiable. Overalls should have the logo of the construction company on It and construction workers should wear identification cards.
Construction site to be demarcated and access to be controlled
Loitering of outsiders at either the construction side or at the construction village should not be allowed. Local SAPS should be requested to assist in this regard.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>Mitigation could reduce the time span of potential impact</td><td rowspan="3">Consequence: Negligible</td><td rowspan="3">Significance: Very low</td></tr>
<tr><td>Extent</td><td>Local</td><td>Impact will be contained at local level</td></tr>
<tr><td>Intensity</td><td>Very low</td><td>Mitigation will lower the crime levels</td></tr>
</table>

Probability	Fairly likely	Mitigation will have a positive impact on the lowering of the crime levels	

8.5.1.10 Impact assessment: 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 both Msukaligwa and Mkhondo Local Municipalities about possibly selling or donating the construction camp to the Local Municipality 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 79: Impact description for the accommodation of construction staff

IMPACT DESCRIPTION: Accommodation for construction staff				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Negative impacts associated with the accommodation of construction staff will be limited to the construction period	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Impacts will affect local communities		
Intensity	Low - negative	Providing accommodation for construction workers will have very little impact on the local communities		
Probability	Very likely	Additional housing will increase the pressure on local infrastructure		
MITIGATION: • Housing of construction workers in a construction village site • Maximisation of the proportion of job opportunities allocated to locals, thus reducing the need for outsiders • Provision of sufficient entertainment facilities (e.g. 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	As per pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation		
Intensity	Very low	Mitigation will alleviate the pressure on local housing		
Probability	Fairly likely	Mitigation will reduce the intensity of the impact		

8.5.1.11 Impact assessment: 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.

Although this impact is listed here under the heading of "Potential impacts during construction," it is possible that it may continue during the project's operational phase.

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 in the area. Communities most likely to be affected are those within close proximity to the railway line including farmers.

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 (in terms of job creation, etc.), it is therefore unlikely that they will experience it as a significant negative impact on the area's sense of place.

The two tables below describe the impact due to the physical intrusion as well as recommended mitigation (or maximisation) measures for both the construction as well as operational phases of the project.

Table 80: Impact description for physical intrusion (construction phase)

IMPACT DESCRIPTION: Physical intrusion (Construction phase)				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	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.	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Localised impact		
Intensity	Moderate - negative	Such intrusion could impinge on the lives of surrounding communities by affecting the area's sense of place		
Probability	Certain	Due to the type of project it will result in an impact on the community		
MITIGATION: • Implement mitigation measures recommended in separate specialist reports on noise impacts and air quality. • Do not engage in construction activities during church gatherings or at night. • Liaise with local communities as to activities scheduled and avoid construction during these times, if possible. • Continuous communication with the affected communities				
POST-MITIGATION				
Duration	Short-term	Will be limited to the construction phase	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Localised impact		
Intensity	Moderate - negative	Mitigation will reduce the impact		
Probability	Certain	Although the impact will persist mitigation will reduce the intensity of the impact on the local communities		

Table 81: Impact description for physical intrusion (operational phase)

IMPACT DESCRIPTION: Physical intrusion (operational phase)				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	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 will continue for the life span of the project.	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Site-specific	Localised impact		
Intensity	Moderate - negative	Such intrusion could impinge on the lives of surrounding communities by affecting the area's sense of place		
Probability	Certain	Due to the type of project it will result in an impact on the community		
MITIGATION: • Implement mitigation measures recommended in separate specialist reports on noise impacts and air quality. • Do not engage in construction activities during church gatherings or at night. • Liaise with local communities as to activities scheduled and avoid construction during these times, if possible. • Continuous communication with the affected communities				
POST-MITIGATION				
Duration	Long-term	The impact will continue throughout the life span of the project	Consequence: Slightly detrimental	Significance: Moderate - negative
Extent	Site-specific	Localised impact		
Intensity	Low - negative	Mitigation will reduce the impact on the local communities		
Probability	Certain	Although the impact will persist mitigation will reduce the intensity of the impact on the local communities		

8.5.1.12 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.

The table below describes the impact due to the possible displacement of people as well as recommended mitigation (or maximisation) measures.

Table 82: Impact description for the displacement of people / households

IMPACT DESCRIPTION: Displacement of people/households				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Relocations and displacement will only occur during the construction phase.	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Displacement will only occur where the railway line impacts on dwellings.		
Intensity	High - negative	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.		
Probability	Certain	It has been established that the proposed routes will require displacement should the project be authorised.		
MITIGATION: • Adequate compensation • Proper grievances measures • Suitable Relocation Action Plan				
POST-MITIGATION				
Duration	Short-term	As per pre-mitigation	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	As per pre-mitigation		
Intensity	Moderate - negative	The implementation of the mitigation measures will lessen the impact.		
Probability	Fairly likely	As per pre-mitigation		

8.5.1.13 Impact assessment: Community / farmer perceptions and responses

The communities in the area generally have no major problems with the proposed upgrade, 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 as well as the effects on air quality due to dust created by construction of the project. Farmers, on the other hand have raised quite a number of serious issues that have been recorded in this report for consideration by 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 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 extremely resistant to the proposed developments. This constitutes a source of social risk to the project, which should be addressed by allaying unjustified community / farmer fears regarding the project, and instituting appropriate mitigation measures to address realistic concerns.

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 83: Impact description for the predicted 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: Low - negative
Extent	Local	Localised impact		
Intensity	Low - 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	Fairly likely	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 and farmers continuously in the construction process • Continued communication • Implement mitigation measures that have been promised • Maintain a transparent approach to the EIA process • Provide for local employment				
POST-MITIGATION				
Duration	Short-term	Mitigation measures will allay the fears of the communities	Consequence: Slightly detrimental	Significance: Very low
Extent	Local	Localised impact		
Intensity	Low - negative	Allaying unjustified community / farmer fears regarding the project will reduce the potential resistance to the project		
Probability	Unlikely	Effective implementation of the mitigation measures will contribute to the change in attitude of the communities towards the project		

The following impacts are representative of the **operational phase** of the project.

8.5.1.14 Impact assessment: Creation/sustaining of employment opportunities

The generation of employment opportunities is the main concern for the communities surrounding the project area. The existing poor socio-economic conditions suggest that provision of employment opportunities will have a significant impact in the local communities. These employment opportunities will have downstream impacts on the economic activity of the area, as the salary and wages earned will mostly be spent in the vicinity of the affected area.

The table below describes the impact of creation and sustainment of employment opportunities during the operational phase as well as recommended mitigation (or maximisation) measures.

Table 84: Impact description for the creation and sustainment of employment opportunities

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Creation / sustaining of employment opportunities (operational phase)</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>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.</td><td rowspan="3">Consequence: Moderately beneficial</td><td rowspan="4">Significance: Low - positive</td></tr>
<tr><td>Extent</td><td>Local</td><td>Localised impact</td></tr>
<tr><td>Intensity</td><td>Moderate - positive</td><td>Salary and wages earned will mostly be spent in the vicinity of the affected area</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">The project will generate jobs which will persit after the construction phase</td></tr>
<tr><td colspan="5">MITIGATION:
• Maximise local employment opportunities through training and capacity building.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Long-term</td><td>Using local employment for permanent jobs will contribute to the local economy</td><td rowspan="3">Consequence: Highly beneficial</td><td rowspan="4">Significance: Moderate - positive</td></tr>
<tr><td>Extent</td><td>Local</td><td>Localised impact</td></tr>
<tr><td>Intensity</td><td>High - positive</td><td>Increased employment levels will increase local economy</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Mitigation will further enhance the positive impacts of the project</td></tr>
</table>

8.5.1.15 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.

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 of local and regional economic benefits during the operational phase as well as recommended mitigation (or maximisation) measures.

Table 85: Impact description for the 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: Moderate - 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	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	Fairly likely	Increased employment levels will contribute to the economy		
MITIGATION: • Maximise local employment and recruitment • Support BEE initiatives • Skills development initiatives • Maintain a transparent approach to the EIA process • Provide for local employment				
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		

8.5.1.16 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 Davel to Nerston line will occur during their *construction phase*.

Positive impacts during this phase will include temporary creation of employment opportunities as well as concomitant economic benefits and possible creation of opportunities for black economic empowerment.

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).

As far as the *operational* phase of the proposed developments is concerned, the most significant *positive* impacts will include the creation of a number of long-term employment opportunities (202 employees).

The effects of the *BEE opportunities* will be a significant positive during this phase, as well as the *local and regional economic benefits* emanating from the BEE opportunities and employment that is created.

It is expected that income will accrue to the area from BEE opportunities, with income emerging from the total annual wage bills for all project components. Social investment initiatives and upgrading of infrastructure in the area can also be regarded as significant positive impacts.

The most significant *negative* impacts likely to occur during the operational phase of the proposed developments will include increase of noise levels due to an increase in rail traffic along the railway line.

It is recommended that the mitigation and maximisation measures included in this report be implemented to decrease the effect of negative impacts on communities and maximise the effect of positive impacts.

In conclusion the proposed railway line 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

8.5.2 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 Davel to Nerston 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).

8.5.2.1 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.

8.5.2.2 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.

8.5.2.3 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 86 presents the CAPEX breakdown by work packages and regions.

Table 86 and Table 87 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 86: 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 87: 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.

8.5.2.3.1 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 88.

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 88 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 88: 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 89: 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 90 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 90: 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 91: Impact description for the regional macro-economic CAPEX

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: Maximise local employment opportunities through training and capacity building.				
POST-MITIGATION				
Duration	Short-term	Using local employment for permanent jobs will contribute to the local economy	Consequence: Negligible	Significance: N/A
Extent	Site-specific	Localised impact		
Intensity	Very low	Increased employment levels will increase local economy		
Probability	Very unlikely	Mitigation will further enhance the positive impacts of the project		

Table 92: Impact description for the local macro-economic CAPEX

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: N/A				
POST-MITIGATION				
Duration	Short-term	Increased levels of employment will persist for the duration of the project	Consequence: Negligible	Significance: N/A
Extent	Site-specific	As per pre-mitigation		
Intensity	Very low	As per pre-mitigation		
Probability	Very unlikely	As per pre-mitigation		

Table 93: Impact description for the regional macro-economic OPEX

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: Moderate - 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	Very likely	Increased employment levels will contribute to the economy		
MITIGATION: N/A				
POST-MITIGATION				
Duration	Short-term	increased levels of employment will persist for the duration of the project	Consequence: Negligible	Significance: N/A
Extent	Site-specific	As per pre-mitigation		
Intensity	Very low	As per pre-mitigation		
Probability	Very unlikely	As per pre-mitigation		

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 Phuzumoya-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-Phuzumoya 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 Phuzumoya; 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 as far as possible;
- 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 magnitude 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 Riverand numerous other river and stream crossings.
- The impact on human settlement, particularly the rural settlement patterns prevailing in the Swaziland section of the new link line.
- 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.

9.2 Recommendations

a) After thorough consideration of the proposed alternatives, from an environmental, social, economic and technical feasibility perspective, it is the EAPs recommendation that route alternative 4 from Westoe Dam to Nerston be considered in conjunction with the upgrading of the existing railway line from Davel to Lothair, and the proposed route layout from Lothair to the Westoe Dam (Figure 44 and Figure 45).

b) 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.

c) 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 for the recommended route alternatives, i.e. the original proposed route alignment from Davel to Westoe Dam and then along alternative 4 to Nerston. The final layout of the EAPs preferred route can be seen in Figure 44 and Figure 45:

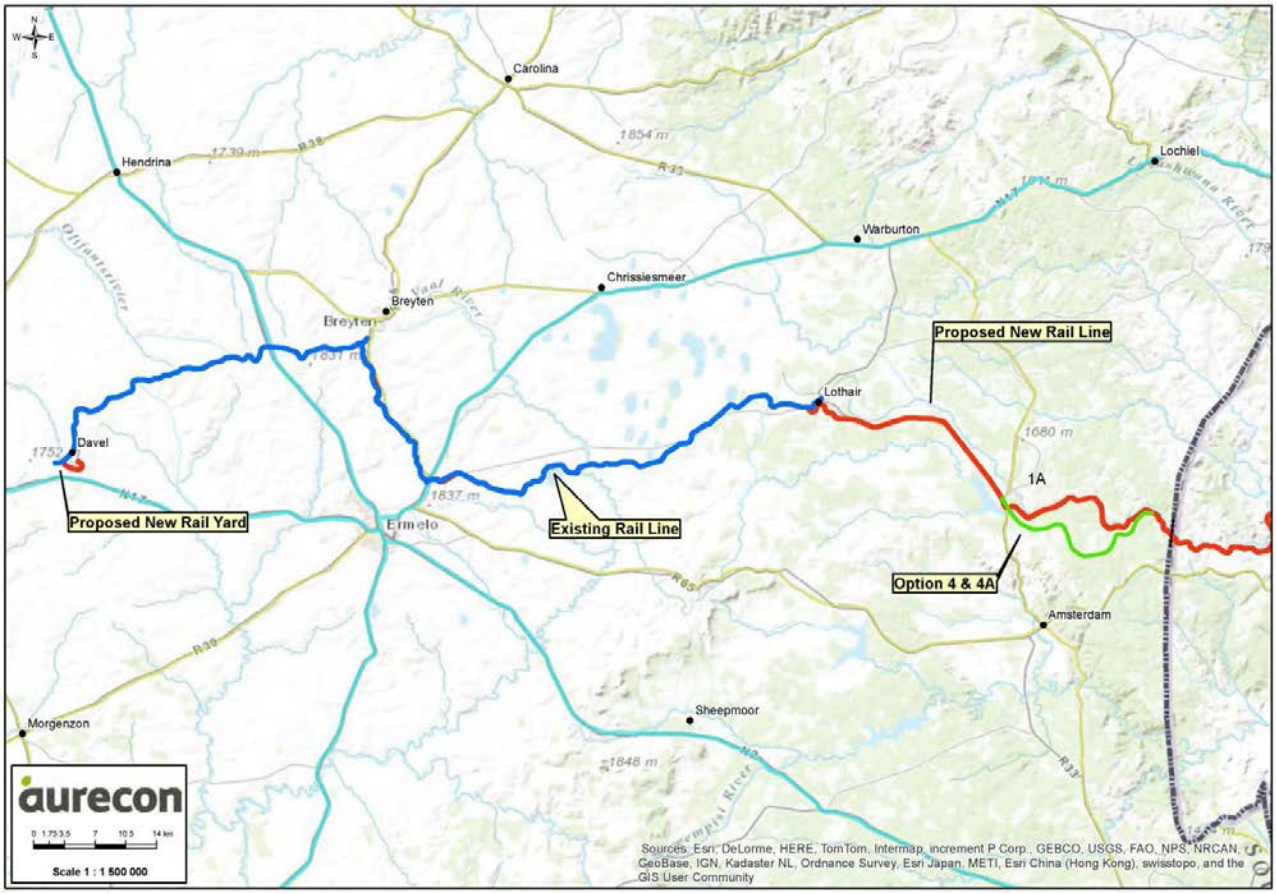

Figure 44: The recommended preferred route will follow the original proposed route alignment from Davel to Westoe Dam and then along the green line via alternative 4 to Nerston.

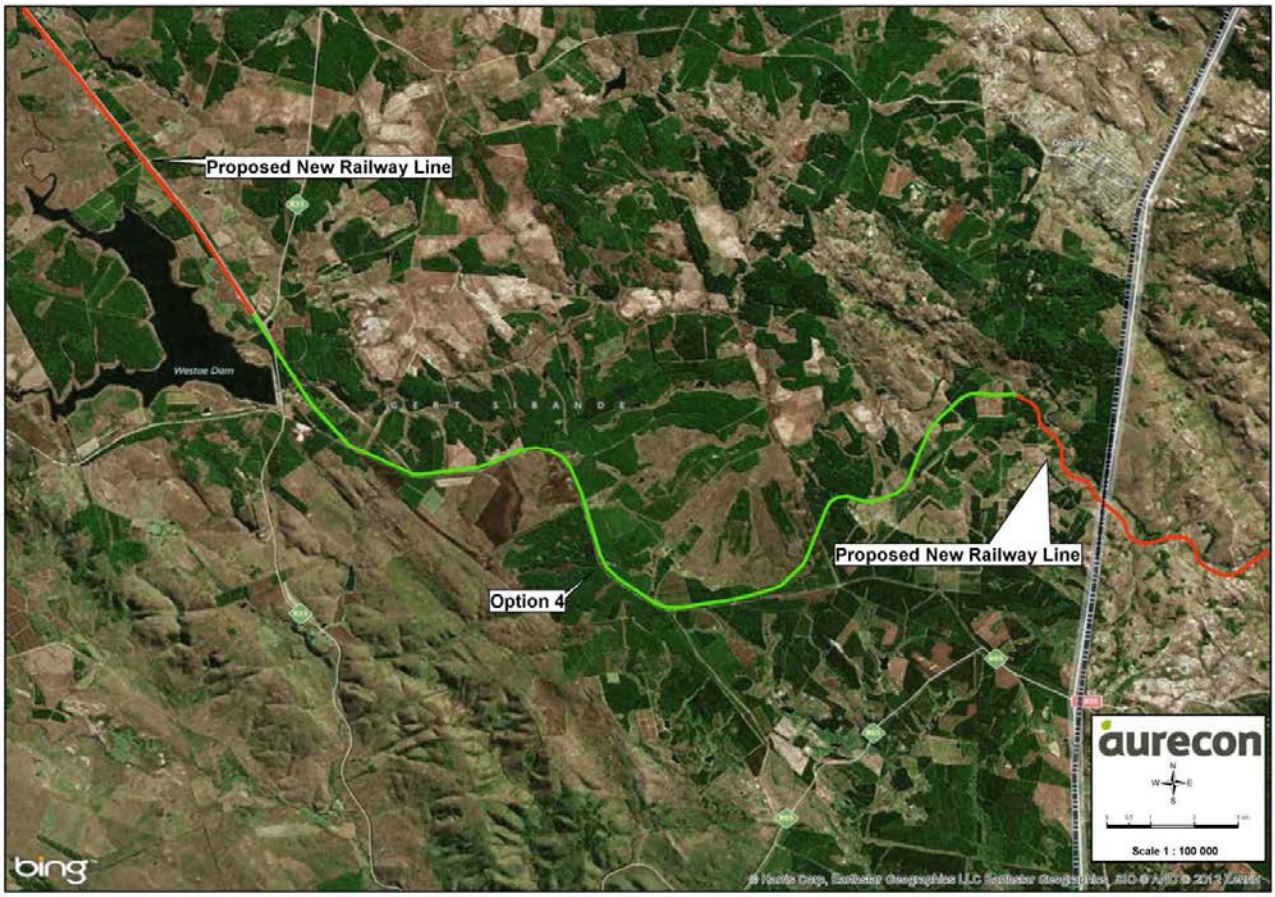

Figure 45: A closer look at alternative 4 from Westoe Dam to Nerston (green line). The red line represents the original proposed route which will be followed up to alternative 4.

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Appendices

Appendix A
Curriculum Vitae

Annexures:

A: Dr Pieter Botha

B: Mrs Candice Dürr

C: Ms Elise Vermeulen

Appendix B
Specialist Reports

Annexures:

Annexure A: Ecological Report

Annexure B: Geohydrological Report

Annexure C: Hydrological Report

Annexure D: Waste Management Report

Annexure E: Social Impact Assessment

Annexure F: Air Quality Assessment

Annexure G: Noise and Vibration Report

Annexure H: Heritage Impact Assessment

Annexure I: Socio-economic Assessment

Annexure J: Paleontological Report

Annexure K: PoSfEIA

Appendix C
Public Participation

Annexures:

Annexure A: BID and notification

Annexure B: Additional notification

Annexure C: Newspaper Advertisements

Annexure D: Site notices

Annexure E: Assistance

Annexure F: I&AP Database

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Annexure I: Notification of FSR

Annexure J: Notification of amended FSR

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Annexure L: Notification of DEIR

Annexure M: Attendance registers

Annexure N: Presentations

Annexure O: Briefing Document

Annexure P: Notification of FEIR

Appendix D
Authority Communication

Annexures:

Annexure A: Application for Exemption

Annexure B: Application forms

Annexure C: Rejection of application

Annexure D: Acceptance of application

Annexure E: Rejection of Scoping Report

Annexure F: Acceptance of Scoping Report

Appendix E
Environmental Management Programme

Appendix F
Waste Management Plan