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Specialist Study 4

Social Impact Assessment

1.1 INTRODUCTION

This section of the report analyses the social impacts that may result from the proposed upgrade of the railway line. These impacts are based on research undertaken to date, including secondary information gathered and the consultation process. The scope of the impact assessment was at a district level in keeping with the brief of the study. The impacts are therefore fairly general, and as such can be applied to all sites within the project area.

The identified impacts (positive and negative) have been assessed in terms of the affects of the proposed project on the receiving socio-economic environment and stakeholders. The project activities are described in *Chapter 4*. The methodology used to assess the identified impacts is explained in *Chapter 3*.

Mitigation measures have been provided that aim to avoid, minimise, reduce, remediate or provide appropriate alternatives for potential negative impacts and enhance potential benefits of the Project. The section furthermore provides a prediction of the residual impact that will remain, assuming that all mitigation measures are implemented.

There are five impacts that have been identified and assessed and two discussion topics that are relevant to the project that make up the impact assessment component. These include:

- Impact on infrastructure and services;
- Impact on employment and procurement;
- Impact on the spread of HIV / Aids and sexually transmitted infections;
- Impact of the increase in social ills;
- Impact on the sense of place;
- Discussion on land issues related to the project and
- Discussion on managing stakeholder perceptions.

Mitigation measures and recommendations are provided under each impact. These mitigation measures are proposed to be adopted by the project proponent and implemented to effect the purpose of the SIA. Some of the general mitigation measures proposed include:

- To develop and implement a Corporate Social Investment (CSI) programme in consultation with local communities;
- To establish a stakeholder engagement plan and appoint a permanent community liaison officer;
- To form partnerships with relevant local government authorities to implement other programmes such as an HIV / Aids awareness programme; and

1.2

IMPACT ON INFRASTRUCTURE AND SERVICES

- To implement a grievance procedure.

This section focuses on the impact on water supply and sanitation and mentions the impact on other social services and infrastructure for the construction and operation phases of the project. *Table 1.1* provides a summary of the project activity, the type of impact and the receptors or stakeholders that may be affected. *Box 1.1* and *Box 1.2* summarise the assessment of the impacts on infrastructure and services at the construction phase and operational phase respectively. *Table 1.2* provides an overview of the significance rating before and after mitigation measures are implemented.

1.2.1

Impact Description and Assessment

Table 1.1

Impact Characteristics: Infrastructure and Services

Summary	Construction	Operation
Project Aspect/ Activity	Use of water in construction and upgrade of loops and access roads to the site. Water, sanitation and electricity requirements of workers and migrant job seekers.	Use of services such as water, electricity and sanitation in upgraded yards and at the substation site. Use of services by migrants who settle in affected towns.
Impact Type	Direct (as related to project activities) and indirect (as related to in-migration).	Direct (as related to project activities) and indirect (as related to in-migration).
Stakeholders/ Receptors Affected	Communities living in the towns that are located along the railway line. Migrant workers. Local municipalities.	Migrant workers and local communities. Local municipalities.

Construction Phase Impacts

Water availability and use: The Northern Cape is in a semi-desert region and as such water is a scarce resource. Despite this, access to water is relatively good in the Northern Cape with the majority (90 percent) of households having access to water, albeit within a proximity of 200 m from the household (Portfolio Committee on Water Affairs and Forestry, 2005).

Parts of the project area in the Eastern Cape fall within what is known as the 'drought corridor' (1) (Usman and Reason, 2004). This region is known for its sporadic droughts and water is generally scarce. Access to water in the major part of the project area in the Eastern Cape is limited. In some areas borehole

(1) The drought corridor extends across the southern African region. This region extends from 20 degrees to 25 degrees south and is typically a summer rainfall region, but the region often experiences fall or more of the summer season under a dry spell.

Box 1.1

Construction Impact: Infrastructure and Services

Nature: The impact will be **negative**. It will be **direct** as related to construction activities and indirect as related to pressure on services sought by job-seekers.

Impact Magnitude: Medium

- **Extent:** The extent of the impact will be **local** as the impacts are likely to be on people living in close proximity to the site.
- **Duration:** The duration will be **short term** to longer as greater impacts will be experienced during the construction period but other impacts on infrastructure and services by migrant job-seekers may persist beyond construction.
- **Intensity:** The intensity is **difficult to rate** as it is likely to be experienced differently by different groups of people in the community. Owing to the variation across communities, a conservative approach has been adopted; hence the intensity is anticipated to be **medium**.

Likelihood: Medium – It is highly probable that there will be an increase in pressure on existing infrastructure.

Impact Significance (Pre-Mitigation): Municipalities are currently struggling to provide adequate infrastructure and services to people in communities already within their jurisdiction. The additional pressure exerted by the construction activities and in-migration will add to the problem of service provision. The significance of increased pressure on already limited infrastructure and services is considered to be of **moderate** significance.

Degree of Confidence: The degree of confidence is **medium** given the lack of information on the state of existing infrastructure at the local level.

Operation Phase Impacts

The operation phase activities will include an increased frequency of trains on the line and ongoing train yard operations as well as intermittent maintenance at train yards and the substation site. It is expected that these activities will not have a big impact on infrastructure and services. The direct impact on water and sanitation facilities will be limited. The indirect impact on these services by the remaining job-seekers, however, would still be significant but lower than the anticipated construction phase impacts. While a few job-seekers are likely to find work, there will be others who will not and will nevertheless choose to remain in the affected communities, placing further pressure on local government to meet infrastructure and service needs, especially in the more remote parts of the project area. The most significant problems relating to infrastructure and services will be the provision of adequate sanitation and housing delivery.

The proposed traction substation at Emul is planned to improve electricity supply to the railway line in the area of Mamathwane to Hotazel. It is unlikely to cause any disruptions to broader electricity supply in the region. However, this depends on management of the local electricity supply by Eskom.

The impacts on roads will be confined to the construction phase. The biggest impact is likely to be at level crossings, where structural changes will be made to the crossing as well as the relocation of private and public roads. This may

water is heavily relied on due to low rainfall characteristic of the Eastern Cape.

Water will be needed for the construction phase of the project. In places where water is scarce Transnet has suggested that water will be trucked into the project area to meet the construction needs. Alternatively, agreements may be reached with local landowners for the use of local boreholes. Transnet has not rejected the possibility of having to establish new boreholes to meet their requirements.

Sanitation throughout the project area is less than adequate. Basic sanitation is supplied to 74 percent of all households in the Northern Cape and in parts of the Eastern Cape only 55 percent have access to adequate sanitation.

Dry sanitation, which is the disposal of human waste without the use of water, has been piloted. This form of sanitation is especially useful in water scarce areas, but acceptance of dry sanitation, which requires a shift in popular perceptions, still needs attention (Portfolio Committee on Water Affairs and Forestry, 2005). Portable sanitation facilities will be supplied by Transnet for its workforce.

People in search of jobs on the proposed Project, who migrate into towns, will further increase the pressure on the already limited water and sanitation services.

Roads: It is likely that there will be an increase in construction vehicle traffic on the roads leading to the development sites. Transnet intends to transport the majority of materials by road. This is likely to have a significant impact on the quality of the roads, especially gravel roads close to the construction sites. The tarred roads in towns may also be impacted due to use by heavy construction vehicles. The impact of traffic within the project area, during the construction phase activities, is addressed as part of the Traffic Impact Annex F.

Other services/infrastructure: The influx of job seekers would potentially exert pressure on other social services and infrastructure such as housing, schools and clinics. Given the housing backlog of 2.4 million homes across South Africa and the mandate of municipalities to provide housing (Mail & Guardian, 2007), the influx of job-seekers into the project area could exacerbate the housing problem. It is likely that these job-seekers will build informal houses, growing the informal areas. The growth in informal areas adds to the difficulty of providing social services to these areas as they are growing fast, making it nearly impossible for local municipalities to meet the growing demand.

Box 1.2

have a positive impact in that it could lead to improvements in the condition of the roads and level crossings.

Operational Impact: Infrastructure and Services

Nature: The impact on infrastructure will be **negative**. It will be direct as related to operational activities and indirect as related to influx of job-seekers.

Impact Magnitude: Low

- **Extent:** The extent of the impact will be local as it will affect the respective communities at particular sites.
- **Duration:** The direct impacts would be long term, while the indirect impacts will most probably be **permanent**.
- **Intensity:** The intensity would be low as the operation of the additional trains is not associated with any changes to infrastructure or major requirements for additional services.

Likelihood: Medium – It is highly probably that there will be an increase in pressure on existing infrastructure.

Impact Significance (Pre-Mitigation): It is expected that the operational impacts will be significantly less than the construction phase impacts given that once the trains are running it will only be the station yards and related facilities, and the level crossings, that will be in use. The impact significance will be **minor**.

Degree of Confidence: The degree of confidence is **medium** given the lack of information on the state of existing infrastructure at the local level.

Mitigation

The objectives of the mitigation measures are to:

- ensure that the project activities do not place any direct pressure on the already strained local infrastructure and services;
- implement corporate social investment projects that off-set impacts on infrastructure and services from in-migration; and
- encourage and support government in improving the levels of infrastructure and services provided in the project area, e.g., public lighting and electricity.

Specific mitigation measures that could be taken include:

- Transnet will meet all practical infrastructure and service needs of its construction and operational phase activities so that no additional pressure is placed on existing capacity. Such interventions include:
 - Transnet will drill boreholes or truck water in, should there be insufficient water to meet the needs of the project during construction and/or operation;
 - Transnet will make sanitation facilities available on-site for all employees and contractors;
 - Use of diesel powered mobile generators for construction activities;
 - Transnet will upgrade and maintain transport routes in the area that are used by project vehicles; and

- Vehicles will be required to use specified routes so as to limit impacts to local roads.

- In order to manage the expectations of potential job-seekers and thus attempt to reduce their numbers, Transnet will advertise the approach to, and requirements for, employment and procurement throughout the Northern and Eastern Cape Provinces.
- Transnet will develop and implement a Corporate Social Investment Programme that clearly outlines their anticipated initiatives. These initiatives will be identified in consultation with the affected local communities. The plan will outline where projects will be implemented and what the nature of the assistance will be. This strategy will be communicated through a stakeholder engagement plan to ensure that expectations remain realistic and are pro-actively managed.

- Transnet will initiate the formation of partnerships, particularly with relevant government departments, to address selected infrastructure and service areas that are negatively impacted by the influx of job-seekers.
- Transnet will establish a stakeholder engagement plan to ensure on-going identification and management of stakeholder issues and concerns. This engagement plan will target residents from all towns. Transnet will appoint a permanent community liaison officer to interact with the communities.

- Transnet will implement a grievance procedure that is easily accessible to local residents, and which allows complaints related to contractor or employee behaviour to be lodged and responded to. Transnet will respond in a serious manner to any such complaints. A grievance register will be maintained by Transnet.

It is important to emphasise that Transnet, while meeting its own infrastructure and service requirements, will not take on the government's responsibility as service provider.

Residual Impact after Mitigation

The implementation of the above mitigation measures will go part of the way to manage and reduce Transnet's direct impact on local services and infrastructure as well as indirect impact through in-migration of job-seekers. The impacts related to in-migration are inherently more difficult to manage. The significance rating may be reduced to one of minor significance during construction and negligible significance during operation. Should the partnership with government not result in any infrastructural improvements as a result of poor partnership or government inputs, the residual significance rating may not be reduced and will remain moderate and minor for the construction and operational phases respectively. The pre- and post-mitigation impacts are compared in *Table 1.2* below.

Table 1.2

Pre- and Post- Mitigation Significance: Infrastructure

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction	MODERATE (negative)	MINOR (negative)
Operation	MINOR (negative)	NEGLIGIBLE (negative)

1.3

EMPLOYMENT AND PROCUREMENT

This section examines the employment and procurement needs of the construction and operation phases of the project. Employment impacts are assessed at the local, regional, and national levels. Similarly the impacts on procurement are assessed at the local, regional, national and international levels. Table 1.3 provides a summary of the project activity, the type of impact and the receptors or stakeholders that may be affected during the construction and operation phases of the project. Box 1.3 outlines the goods and services that will be procured and whether these are procured at a local, regional, national or international level. Box 1.4 and Box 1.5 summarises the assessment of the impacts on employment and procurement at the construction phase and operational phase respectively. Table 1.4 outlines the significance rating of the impact before and after the implementation of mitigation measures.

1.3.1

Impact Description and Assessment

Table 1.3

Impact Characteristics: Employment and Procurement

Summary	Construction	Operation
Project Aspect/ Activity	Upgrade and construction of railway and associated infrastructure including access roads, refurbishment of station yards and establishment of laydown areas. Procurement of goods and services required for the upgrade of loops, refurbishment of yards and other construction related activities. Indirect employment opportunities as a result of procurement of goods and services. Induced employment opportunities through increased spending in the local economy. Direct (as related to the project) and indirect (as related to employment and procurement by contractors).	Operation of trains and station yards (direct employment). Routine maintenance of railway line and trains in train yards. Procurement of goods and services related to routine maintenance of the line and the associated yards and substation. Indirect employment opportunities as a result of procurement of goods and services. Induced employment opportunities through increased spending in the local economy. Direct (as related to the project) and indirect (as related to employment and procurement by contractors).
Impact Type	Direct (as related to the project) and indirect (as related to employment and procurement by contractors).	Direct (as related to the project) and indirect (as related to employment and procurement by contractors).

Summary	Construction	Operation
Stakeholders / Receptors Affected	Local and regional workforce. Local, regional, national and international contractors and manufacturers of rail equipment.	Local and regional workforce. Local, regional, national and international contractors and manufacturers of rail equipment.

Construction Phase Impacts

The railway line traverses parts of the Northern Cape and Eastern Cape Provinces. These provinces have extremely high unemployment rates, being 54 percent and 50.5 percent respectively (Stats SA, 2008). Agriculture is the primary sector of employment in the rural areas, which comprise the major part of the study area. It is unlikely that many people will have the necessary skills or experience for the project due to the concentration of employment in the agricultural sector. In addition, the low levels of education and skills mean that there will possibly be high numbers of unskilled job-seekers.

The construction phase will be divided into the following activities;

- upgrade and construction of the loops requiring the operation of machinery by skilled workers and artisans; unskilled workers will be used for manual labour at the sites;
- relocation of signalling equipment and related structures associated with loop extensions and construction;
- improvement and construction of access roads to the sites;
- alteration of existing level crossings associated with existing loops;
- refurbishment of the station yards in the Northern Cape;
- construction of the traction substation at Emil;
- creation of new borrow pits within the rail reserve; and
- the establishment of laydown areas.

The construction period is short as each loop will take between three and five months to complete. Contracts will be awarded to contractor firms for the construction of sets of six to nine loops. With only a possible nine loops identified for the first phase of construction, a maximum of two contracts may be awarded in Phase 1 of this project. The list of loops in Phase 1 is, however, subject to change. The employment period for Phase 1 will likely range from 15 - 27 months.

The construction phase of the proposed upgrade of the Transnet railway line and associated infrastructure will result in direct employment both locally and regionally through on-site contractors. Due to the highly technical nature of the construction phase, a large proportion of the workforce will be skilled and semi-skilled employees. It is envisaged that the project will create employment opportunities for approximately 75 skilled and 100 unskilled workers for each contract. The jobs that will be created are temporary in nature as they will only last for the duration of the construction phase. Unskilled labour will be sourced from the nearest towns in the surrounding

area, while skilled labour will be sourced from within South Africa, preferably from local areas and the affected provinces.

In addition to the few direct employment opportunities available to local people, there will be a small number of indirect and induced employment opportunities generated.

- **Indirect employment** will be created as contractors appointed by Transnet will employ local labour. The details of labour to be recruited by contractors are not known at this stage. Transnet has indicated that the intention is for semi-skilled and unskilled labour to be recruited locally.

- **Induced employment** will also be created through increased spending in the local economy by employees and migrants into the project area. The small scale of the project means that indirect and induced employment is likely to be extremely limited.

According to Transnet, most of the goods and services required are highly specialised. Consequently few of these may be available at the regional and the local levels with the exception of civil and earthworks contractors.

Given the scale and nature of the project the vast majority of goods and services will either be procured nationally (predominantly Gauteng) or internationally (Europe). The total estimated budget of the project is approximately R3 billion. Local businesses throughout the project area differ in size and nature. They will, therefore, have varying capacities to deliver on the needs of the project. *Box 1.3* provides an overview of the major goods and services that will need to be procured as well as the anticipated origin thereof.

Box 1.3

Goods and Services to be Procured

International/ National Procurement

- Rails and turnout components will be sourced internationally;
- Traction substation equipment will be sourced from South Africa and internationally;
- Signalling and telecommunication equipment will be sourced from South Africa and internationally;
- Sleepers and fastenings will be sourced within South Africa;
- Overhead traction equipment will be sourced within South Africa; and
- Overhead traction equipment, signalling and telecoms contractors will be sourced within South Africa.

Regional/ Local Procurement

- Ballast and layer works material will be sourced from the relevant province but as close as possible to the site;
- Civil and earthworks contractors will be sourced regionally and locally depending on their availability; and
- Plant laying contractors will be sourced regionally and locally depending on their availability.

South Africa will experience a general election in early 2009. There is a strong possibility that job creation will be raised as a key issue during the campaign leading to increased popular expectations in the period that follows. This may impact on the subsequent demand for employment on the proposed development.

Box 1.4

Construction Impact: Employment and Procurement

Nature: The impact will be positive and be direct (where related to the project activities), indirect (created through the Transnet supply chain), as well as induced (by increased employee spending).

Impact Magnitude: The magnitude of the impact is low.

- **Extent:** The extent of the impact will be experienced at the local, regional, national and international scales; skilled labour will be sourced nationally and unskilled labour will be sourced locally.
- **Duration:** The duration will be short-term as it will last for the duration of the construction phase. Construction time could range from a few months - the time required for the construction of one loop - to 15-27 months for the completion of each phase of the project.
- **Intensity:** The intensity of the employment and procurement is low due to the limited number of jobs that will be created, the temporary nature thereof, and the procurement of key equipment from outside South Africa.

Likelihood: High - Procurement of goods, services and employment (direct and indirect) will definitely be created during the construction phase.

Impact Significance (Pre-Mitigation): The impact significance will be minor.

Degree of Confidence: The degree of confidence is medium, given the lack of information regarding employment and procurement procedures.

Operation Phase Impacts

Few permanent jobs may be generated during the operational phase.

Permanent positions may be required for administrators, private secretaries, yard masters, yard officials, yard foreman, sundry workers, section managers, chief shedmen, shed assistants, shedmen, train assistants, train control officers, service drivers and general workers. It is unclear if those to be employed to these positions are already either in the general employ of Transnet or on the current railway line, or will need to be recruited anew.

The number of these jobs will increase as the capacity of the line increases over time. Temporary and permanent indirect employment opportunities will be created in the manufacture of the wagons and equipment for the railway line. These jobs require skilled and semi-skilled workers with relevant experience.

It is unlikely that maintenance activities will be outsourced. However, in the event that it is, these contracts are not expected to be of large value or involve many people.

Operational Impact: Employment and Procurement

Nature: The impact will be positive and direct as the operational phase will provide some permanent employment.

Impact Magnitude: Negligible

- **Extent:** The extent is both local and regional with respect to employment, as well as national and international, with respect to procurement of rail equipment and wagons.
- **Duration:** The duration will be long term as permanent work will be created over the lifespan of the railway line. However, the frequency of job creation and procurement will intermit as goods and services will be procured as they are needed.
- **Intensity:** The intensity of the impact will be negligible given the few permanent job opportunities that will become available and the temporary nature of procurement.

Likelihood: Low - It is possible that job creation and procurement will occur during operations.

Impact Significance (Pre-Mitigation): The impact significance will be negligible.

Degree of Confidence: The degree of confidence is medium as the exact number of employment and procurement opportunities that will be created is still unknown.

Mitigation

The objective of mitigation is to optimise opportunities for employment and the procurement of goods and services from South Africa where possible, particularly from the localities immediate to the project sites.

Specific mitigation measures proposed are:

- Transnet will establish a recruitment procedure which prioritises the employment of South Africans, specifically local residents (1) by setting relevant criteria as part of the recruitment process. Unskilled labour opportunities will be evenly distributed throughout the project area. In addition, unskilled labour targets will reflect an even distribution of opportunities within the project area.
- Transnet will build the capacity of employees and provide them with relevant training certificates and letters of reference. This may enable them to access other jobs following the completion for the transmission line.
- Procurement targets, focussing on South African suppliers, will be incorporated into the key performance indicators of the project team, and specified in the relevant contracts.
- Transnet will implement a simplified procurement process for small-scale contracts to enable small/less experienced local level suppliers to tender for the work. To make this possible, Transnet will operate a 'help-desk' facility to provide advice and guidance to those who require support.

(1) The definition of 'local' should be agreed upon with key project stakeholders from the area.

- Transnet will advertise the approach (e.g., selection criteria) to and, requirements (e.g., skills and experience) for employment and procurement throughout the Northern and Eastern Cape Provinces. These will actively be made available to local recruitment offices and community/traditional leaders. This should be done far in advance of the commencement of employment and procurement.
- Transnet will establish a stakeholder engagement plan to ensure on-going identification and management of stakeholder issues and concerns. This engagement plan will target residents from all directly affected towns. Transnet will appoint a permanent community liaison officer to interact with these communities.
- Transnet will implement a grievance procedure that is easily accessible to local residents, and which allows complaints related to contractor or employee behaviour to be lodged and responded to. Transnet will respond in a serious manner to any such complaints. A grievance register will be maintained by Transnet.

Residual Impact after Mitigation

The proposed project is not likely to generate significant direct, indirect or induced employment or procurement opportunities. These will be limited due to the short construction period and small number of workers required for the ongoing operations. If Transnet commits to maximising opportunities for South Africans, specifically locals, by implementing the mitigation measures, a positive impact, albeit small, will be realised. The post-mitigation significance rating will remain one of moderate positive significance during construction and minor positive significance during operation. The pre- and post-mitigation impacts are compared in Table 1.4 below.

Table 1.4

Pre- and Post- Mitigation Significance: Employment and Procurement

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction	MINOR (positive)	NEGLECTABLE (positive)
Operation	NEGLECTABLE (positive)	NEGLECTABLE (positive)

1.4

IMPACT ON THE SPREAD OF HIV/AIDS AND SEXUALLY TRANSMITTED INFECTIONS (STIs)

This section highlights the mortality profile of both the Northern Cape and Eastern Cape Provinces, however, the focus is on the impact on the spread of HIV/Aids and sexually transmitted infections. It is believed that the impact on the spread of HIV/Aids and STI's is the most relevant to the project activities. The impacts are assessed at the local level as this is the locus of the impact.

Table 1.5 provides a summary of the project activity, the type of impact and the receptors or stakeholders that may be affected during the construction and operation phase of the project. Box 1.6 indicates key elements of a typical HIV/AIDS programme that could be used by Transnet in the development of a programme for the project. Box 1.7 summarises the assessment of the impacts on the spread of HIV/AIDS and STI during the construction phase and operational phase respectively.

Table 1.6 outlines the significance rating of the impact before and after the implementation of mitigation measures.

1.4.1 Impact Description and Assessment

Table 1.5 Impact Characteristics: Spread of HIV/AIDS and STIs

Summary	Construction & Operation
Project Aspect/ Activity	Construction of loops, substation and refurbishment of yards; Operation of yards.
Impact Type	Indirect
Stakeholders/ Receptors Affected	Local community Local health department and clinics Transnet contractors and workforce Migrant workers

Construction and Operation Phase Impacts

The mortality profile of the Northern Cape shows that 51 percent of deaths are attributed to non-communicable diseases, particularly cardio vascular disease. Twenty-three percent of deaths are attributed to communicable diseases and malnutrition, including 14 percent to HIV/AIDS and 11 percent to injuries. The prevalence of HIV is higher in women than men, with 16 percent of all female deaths compared to 14 percent of all males deaths. The percentage of deaths as a result of injuries among males is more than double that for females (MRC, 2000).

The mortality profile of the Eastern Cape shows that 43 percent of deaths are attributed to non-communicable deaths. As in the Northern Cape, cardio vascular disease is the primary non-communicable disease. However, the prevalence of HIV in the Eastern Cape is much higher as it is the main cause of death in the province. Twenty percent of deaths are HIV/AIDS related, with more women (23 percent) dying of HIV/AIDS than men (17 percent)⁽¹⁾. Deaths caused by communicable diseases are also higher in the Eastern Cape at 27 percent (MRC, 2000).

(1) The percentages of deaths attributed to HIV/AIDS is a percentage of all female and male deaths.

Box 1.6

Due to the lack of information on health statistics at the local level and given the prevalence of HIV/AIDS it is believed that HIV/AIDS and STIs are most relevant to the project activities. This is because it has an immediate and direct effect on the workforce and the local communities at the project sites. An increase in migrant workers is often linked to an increase in the transmission and prevalence of STIs given the rise in the number of single men within a targeted area. Prostitution also tends to become more common. This in turn exacerbates the transmission and, therefore, the prevalence of HIV/AIDS and STIs. The increased prevalence of these diseases could affect contractors, employees, local residents and the families and sexual partners of anyone becoming infected in the project area. Given that workers will not be housed in labour camps but amongst the community, it will be extremely difficult to limit the extent of the interaction of the workforce with the local communities. See Box 1.6 for key elements of typical HIV/AIDS programmes that could be used as a model by Transnet should it implement such a programme in conjunction with the local health department.

Key Elements of HIV/AIDS Programmes

The key elements of an HIV/AIDS prevention programme are as follows:

- **Prevention:**
 - Raise awareness (address the facts and fiction of HIV transmission);
 - Get the message out (make use of local languages or non-written forms of communication);
 - Go beyond the workplace;
 - De-stigmatise the disease;
 - Peer education (train and support peer educators);
 - Review occupational health and safety procedures;
 - Condom distribution;
 - Circumcision promotion;
 - Voluntary HIV testing and counselling;
 - Post exposure prophylaxis programme for all employees with potential exposure to blood or body fluids;
 - Prevention of Mother-to-Child Transmission; and
 - Training of managers and supervisors - to improve programme success.
 - **Treatment and Care:**
 - Anti-Retroviral Treatment (ART);
 - ART programme for family members;
 - Adherence promotion;
 - Preparation for treatment;
 - Controlled dispensing of medication;
 - Ongoing adherence monitoring promotion;
 - Provision of nutritional programme; and
 - Terminal and home-based care.
- Source: ICMIM, Good Practice Guidance on HIV/AIDS, Tuberculosis and Malaria, 2007

Construction and Operational Impacts: HIV/Aids and STIs

Nature: The potential changes to the levels of health would be a **negative indirect** impact in the project area.

Impact Magnitude: Medium

- **Extent:** The impacts of HIV / AIDS and STIs will be experienced at the local level but could be transmitted outside the project area depending on the origin of the workforce and job-seekers.
- **Duration:** The impact is likely to be **permanent** (HIV / AIDS) with the potential to result in death.
- **Intensity:** The intensity will be **medium** as those affected are likely to require support.

Likelihood: Medium - It is likely that an increase in the prevalence of these diseases will be experienced. It will, however, be very difficult to link this directly to the Transnet project activities.

Impact Significance (Pre-Mitigation): Moderate

Degree of Confidence: The degree of confidence is **medium** given the uncertainties related to the numbers of employees/contractors and extent of in-migration.

Mitigation

The objectives of mitigation are to minimise the transmission of diseases, through effective control measures and to reduce the impact of the disease on the health of employees/contractors to the lowest possible level.

Transnet cannot accept sole responsibility for the management of all health related matters. They will, however, be able to enforce some controls, specifically with respect to the project activities and workforce. Transnet can partner with relevant authorities to deliver appropriate interventions on a wider scale.

Specific mitigation measures should include:

- Transnet will establish a stakeholder engagement plan to ensure on-going identification and management of stakeholder issues and concerns. This engagement plan will target residents from all affected towns. Transnet will appoint a permanent community liaison officer to interact with the affected communities.
- Transnet will implement a grievance procedure that is easily accessible to local residents, and which allows complaints related to contractor or employee behaviour to be lodged and responded to. Transnet will respond in a serious manner to any such complaints. A grievance register will be maintained by Transnet.
- Transnet will implement an education programme for all of its own and contract employees to educate them about the measures for mitigating the

transmission of HIV / AIDS and STIs. Condoms will be made available to the workers.

- Transnet will implement an HIV / AIDS programme in the project area addressing factual health issues as well as behaviour change issues around the transmission of, and infection by, HIV / AIDS and other STIs. This will be done in association with local health providers. The programme will include making condoms available within affected communities.
- Transnet will seek to foster a relationship with local health providers such that they can monitor changes in levels of community health and wellbeing.

Residual Impact

The negative impacts associated with HIV / AIDS and STIs will be difficult for Transnet to manage. Awareness and education programmes for the community could have a positive impact. The key is for Transnet to explore ways in which to partner with local authorities and relevant organisations as a means of reducing this impact. It is unlikely that the mitigation measures will assist in reducing the significance rating below one of moderate negative significance. However, should Transnet choose not to manage this impact, the significance of the impact could increase. The pre- and post-mitigation impacts are compared in *Table 1.6* below.

Table 1.6 Pre- and Post- Mitigation Significance: Spread of HIV/Aids and STIs

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction	MODERATE (negative)	MODERATE (negative)
Operation	MODERATE (negative)	MODERATE (negative)

1.5 INCREASE IN SOCIAL ILLS

This section highlights the potential impact of the increase in social ills as it is related to the increase of job-seekers and employees on the project. The impacts are limited to the construction phase of the project and it is assessed at the local level. The impacts assessed include, *inter alia*, increase in prostitution, increase in the consumption and sale of alcohol and drugs, potential increase in domestic violence and an increase in violence in general. *Table 1.7* provides a summary of the project activity, the type of impact and the receptors or stakeholders that may be affected during the construction phase of the project. *Box 1.8* outlines the assessment of the impacts of an increase in social ills during the construction phase. *Table 1.8* indicates the significance rating of the impact before and after the implementation of mitigation measures.

Table 1.7 Impact Characteristics: Increase in Social Ills

Summary	Construction
Project Aspect/ Activity	Construction of loops and refurbishment of yards. Influx of job-seekers. Increase in disposable income.
Impact Type	Direct (with respect to the project) and indirect (with respect to in-migration).
Stakeholders/ Receptors Affected	Transnet and contractor employees Local municipality Local communities Migrant job-seekers Stakeholders most vulnerable to this impact are: the elderly, the unemployed, single women, and adolescents

Construction Phase Impacts

Social change is typically linked to an influx of people into an area in the form of employees directly related to the project, as well as job-seekers, migrating into the area in anticipation of work. As a worst-case scenario, these changes have been known to cause increased vulnerability and the susceptibility of host communities to a range of social pathologies, including increased levels of crime, substance abuse, increased incidence of sex workers, and domestic violence. As mentioned above, the construction period will be short, the employment opportunities limited, with the consequent influx of migrants likely to be limited.

The types of social pathologies that may result from an influx of job-seekers are described further below. These may only be evident to a small degree should the influx of people be limited for the reasons noted.

- Increased disposable income may result in the **increased incidence of prostitution and casual sexual relations**. These sexual relations could lead to an increased incidence of HIV/AIDS (baseline studies showed high prevalence of HIV/AIDS).
- Children may be conceived with migrant workers. Given the temporary nature of the work, it is possible that both the women and children will be abandoned when the construction phase ends and the contractors move on, leaving **single female-headed households**.
- Increased levels of disposable income could exacerbate the levels of **substance abuse**. Abuse of alcohol, and possibly of drugs, often correlates with **increased levels of criminal behaviour** and violence, such as domestic violence, both while under the influence of the substance, or as a desperate measure to find financial or material means with which to support the habit. Such behaviour increases the number of people indirectly affected by, or vulnerable to, substance abuse.

Social and cultural diversity, as well as the possible changes associated with an influx of people, could increase people's vulnerability and susceptibility to the social ill's discussed above.

The major part of the area which the railway line traverses is rural with agriculture being the primary sector of employment. The agricultural sector in general is renowned for the high levels of substance abuse by farm workers. Through the stakeholder engagement process it was established that some of the communities in the project area have an existing substance abuse problem.

Transnet intends workers to find accommodation within the local towns.

This will make it difficult for the company to mitigate any increase in social ill's that may arise from this influx of workers. Conversely, the workforce will also be susceptible to the impacts of social ill's existing within host communities and may also find themselves victims to incidents such as violent attacks by disgruntled locals.

Following the construction phase of the proposed upgrades to the railway line, it is unlikely that any further job-seekers will move into the area. It is anticipated that few of the job-seekers, who arrive for the construction phase, will remain in the area as there are likely to be few immediate employment opportunities for general workers during the operational phase. Some migrants may remain in the area and are likely to adjust to the social conditions of the area. Some social ill's may, however, still be felt in the operational phase, such as the impact on women that are left to raise their children on their own.

Box 1.8

Construction Impact Increase in Social Ills

Nature: The nature of the impact will be negative and indirect.

Impact Magnitude: Medium

- Extent:** The impacts will be experienced at the local level.
- Duration:** The impacts will be short-term, as they will be experienced for the duration of the construction phase. The impact will be more significant after workers have been paid as many social ill's are linked to increased disposable income.
- Intensity:** The intensity will be medium as social ill's such as drug and alcohol abuse are already a problem in many of the towns.

Likelihood: Medium - It is highly likely that there will be an increase in social ill's.

Impact Significance (Pre-Mitigation): The impact significance is moderate.

Degree of Confidence: The degree of confidence is medium given that the assessment is based on secondary data and due to the limited feedback on this matter from the consultation process.

Mitigation

The objectives of mitigation are to:

- limit, where possible, social pathologies brought about by in-migration into the project area; and
- ensure that Transnet and contractors manage their employees in such a way that the impacts on local communities are limited.

Specific mitigation measures proposed are:

- Transnet will develop and implement an induction programme, including a Code of Conduct, for all employees and contractors, which will include the following:
 - Respect for local residents and customs;
 - Zero tolerance of illegal activities by construction personnel including using the services of prostitutes, illegal sale or purchase of alcohol, sale, purchase or consumption of drugs or illegal gambling or fighting;
 - No use of project vehicles for non-business purposes;
 - Description of disciplinary measures for infringement of stipulated protocols; and
 - At a minimum, the legal speed limit should be adhered to.

- Transnet will develop and implement a Corporate Social Investment (CSI) Programme that clearly outlines its anticipated initiatives. These initiatives will be identified in consultation with the affected local communities. The plan will outline where projects will be implemented and what the nature of the proposed interventions will be. The strategy will be communicated through the stakeholder engagement plan to ensure that expectations remain realistic and are pro-actively managed. Transnet will initiate the formation of partnerships with relevant government departments, such as law enforcement agencies to initiate a community policing forum, to address identified areas of need.

- In order to manage the expectations of potential job-seekers and thus attempt to reduce their numbers, Transnet will advertise the approach to and requirements for employment and procurement throughout the Northern and Eastern Cape Provinces.

- Transnet will establish a stakeholder engagement plan to ensure on-going identification and management of stakeholder issues and concerns. This engagement plan will target residents from all towns. Transnet will appoint a permanent community liaison officer to interact with affected communities.

- Transnet will implement a grievance procedure that is easily accessible to local residents, and which allows complaints related to contractor or employee behaviour to be lodged and responded to. Transnet will respond in a serious manner to any such complaints. A grievance register will be maintained by Transnet.

Residual Impact

The increased incidence of social ills is often associated with rapid change, in this case linked with in-migration and the Transnet workforce living amongst the local communities. Responses to this change can vary dramatically from person to person and can change over time. As Transnet does not intend to house its workforce and contractors, its ability to mitigate the impacts which are directly related to the project activities will be difficult. By implementing the above mentioned mitigation, together with the social tendency for people to adapt to and accommodate change, it is possible that the significance could remain moderate during the construction phase. Without mitigation, it is possible that the social ills could worsen. The pre- and post-mitigation impacts are compared in *Table 1.8* below.

Table 1.8

Pre- and Post- Mitigation Significance: Increase in Social Ills

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction	MODERATE (negative)	MODERATE (negative)
Operation	N/A	N/A

1.6

IMPACT ON SENSE OF PLACE

This section assesses the impact of a change in the sense of place at the local level. This is an aspect that can be easily overlooked and difficult to assess due to the subjectivity of the impact. The section assesses the potential impacts on different groups in a community. It also highlights the impact on infrastructure and other factors such as noise, traffic, dust as well as other proposed developments in the projects area, all contributing to a change in the sense of place. *Table 1.9* provides a summary of the project activity, the type of impact and the receptors or stakeholders that may be affected during the construction and operation phases of the project. *Box 1.9* and *Box 1.10* outline the assessment of the impacts on sense of place during the construction phase and operational phase respectively. *Table 1.10* outlines the significance rating of the impact before and after the implementation of mitigation measures.

Table 1.9

Impact Characteristics: Sense of Place

Summary	Construction	Operation
Project Aspect/ activity	Upgrade and construction of railway and associated infrastructure including access roads, substation, refurbishment of station yards and establishment of laydown areas, Noise, dust and vibration associated with the construction activities.	Increase in the number of trains per day. Greater activity at level crossings.
Impact Type	Direct (with respect to project activities) Indirect (with respect to in-migration)	Direct (with respect to project activities) Indirect (with respect to in-migration)
Stakeholders/ Receptors Affected	Communities located along the railway line.	Communities located along the railway line.

Construction Phase Impacts

Assessing a change in a sense of place is often difficult because it is not tangible nor can it easily be measured. It may, however, have a significant impact given the context of the area. It is also likely to be experienced differently by different groups within any community.

Most of the areas which the railway line traverses are rural and economically depressed. Agriculture is the most common economic activity practiced throughout the Eastern Cape and Northern Cape Provinces. Mining is a large contributor to the economy in the Northern Cape. The primary employment sectors are agriculture, personal services, government and social services. Many of the places in the project area are isolated and remote. Some of the remote areas visited during the public participation process included Rosmead, Golden Valley and Alicedale in the Eastern Cape and Hotazel and Hanover in the Northern Cape.

From the beginning of construction, when contractors begin project activities using large-scale machinery, the nature of the area will be affected. Construction activities will directly increase ambient air and noise pollution as well as traffic along local roads. It will also impact visually on the area. The combined activities in the project area will change the sense of place. The most likely contributors to this change are explained further below.

An **influx of people** into the area in search of employment has the potential to alter the sense of place. It is envisaged that workers on the project will not be

housed in labour camps but rather live amongst the local communities. The influx of job-seekers is usually associated with an increase in social ills as stated in *Section 1.5*. The influx can also result in an increase in cultural diversity, but simultaneously increases the potential for conflict and tension as people compete for scarce resources.

- Due to the remote nature and isolation of large parts of the project area, it is predicted that the sense of place will change during the construction phase. The construction phase activities will result in the creation of **nuisance factors**, e.g., dust, noise, vibration and an increase in traffic. It is predicted that the impact of each of the aforementioned will be negligible as reported in the specialist studies on noise, vibration and traffic (see Annex A, F and G, respectively). However, the in-combination effect on the sense of place is likely to be intensified.

- Through the stakeholder engagement process, specifically in the Northern Cape, reference was made to **other proposed developments** in the area. The cumulative impact of all these developments will exacerbate the impact on sense of place, should they be realised. The types of developments that were mentioned were mainly related to new or expanded mining operations in the vicinity of Postmasburg, Mamatlwane and Hotazel. However, it should be borne in mind that this area is already largely transformed by mining activities, so the new developments will not be unique in the landscape or contrary to the current land use activities.

- The construction activities also have the potential to impact on the **quality of roads**, especially local secondary roads that can not handle increased volumes of heavy vehicle traffic. It is unclear what the current conditions of the roads in the affected areas are, but the quality of the roads will most likely worsen with the planned activities. This is discussed further in Annex F.

For residents less likely to benefit from the development in the area, such as the elderly, the sick, or those unable to secure employment, this change could be accompanied by a sense of loss for the "way things were", with possible mental health issues arising, such as depression. This could be heightened by the social pathologies typically associated with development in previously rural/untouched areas, e.g., increased alcohol abuse, petty crime). However, this could be countered by the increased positivity in local communities owing to opportunities associated with employment stimulation of local businesses and longer term opportunities associated with the increase in freight transport along the railway line.

Construction Impact: Sense of Place

Nature: This impact is **direct** with respect to project activities and **indirect** with respect to changing demographics in the form of in-migration. The impact on the change in the sense of place will be negative for vulnerable groups as well as for those that will not benefit from the project. For others, a changed sense of place and the opportunities this brings will be perceived as a positive impact.

Impact Magnitude: The impact magnitude can vary from low to medium depending on the sector of the community and the location of the town within the project area.

- **Extent:** The extent will be experienced at the local level, throughout the project area.
- **Duration:** The changed sense of place in the more rural settings is expected to be permanent, beginning in construction (and possibly during pre-construction), and continuing beyond closure.
- **Intensity:** The intensity is likely to vary throughout the project area and will also vary for different sectors of the population. The intensity will thus be low for urban areas within the project area, medium for areas that would benefit from the project such as the rail hubs at De Aar and Kimberley, and high for remote areas.

Likelihood: Medium - It is highly likely that the sense of place will be impacted in many areas, albeit to varying degrees.

Impact Significance (Pre-Mitigation): Due to the variation in the intensity and impact magnitude, the significance could be rated as either **minor** or **moderate**.

Degree of Confidence: The degree of confidence is **medium** as there was no fieldwork undertaken for this assessment. Field observations and photographic logs were provided by other team members. Previous studies show that a change to the sense of place is probable.

Operation Phase Impacts

The operational phase impacts relating to the change in the sense of place are largely restricted to the anticipated increase in the frequency of trains and the general increase in activity around level crossings. Noise and vibration will increase due to the increased number of train movements per day.

The increase in rail traffic will impact on movement patterns across the line. This will be significant in places where the line intersects with busy areas of towns, such as residential areas or those close to schools and clinics.

The indirect impact of the in-migration of job-seekers on the sense of place may decrease from that experienced during the construction stage. This is anticipated because most job-seekers are likely to seek work elsewhere. Some may stay behind but are likely to assimilate into the host communities.

It is also possible that a change in the sense of place could be positive. Many of the towns along the railway line have lost their vibrancy due to a reduction in the frequency of the rail service over time. It is possible that the Transnet project will inject new opportunities into the towns along the line and revive the railway hubs. This vision is reflected in the Pixely Ka Some District Municipality Growth and Development Strategy (2007/2008) for example, which identifies the revitalisation of the De Aar railway hub as part of its proposed economic initiatives. The potential for positive change brought

about by the project was also expressed at several stakeholder engagement meetings.

The change in the sense of place will have positive impacts for those who are easily able to adapt to change and benefit from the project activities. For those that are unable to adapt, the changes may have an emotional impact, leading to a sense of alienation from a familiar environment.

Operational Impact: Sense of Place

Nature: The impacts are both **negative** (with respect to the inability of people, especially the elderly, to adapt to changes and benefit from the project) and **positive** (with respect to the potential of positive economic benefit and revitalisation arising from the project). The impacts are both **direct** (with respect to improved rail transport) and **indirect** (with respect to changes in movement patterns).

Impact Magnitude: Low

- **Extent:** The impact will be experienced at the local level throughout the project area.
- **Duration:** The duration of the impacts will be **long-term**.
- **Intensity:** The intensity could vary throughout the project area and it will also be experienced differently by the different sectors of the population. The intensity will consequently either be **low** or **medium**, depending on the ability of those impacted to adapt to change in the sense of place. It may be **low** for the youth and the economically active and **medium** for the elderly.

Likelihood: Medium - It is highly likely that the sense of place will be impacted.

Impact Significance (Pre-Mitigation): The impact would be **minor**.

Degree of Confidence: The degree of confidence is **medium** as there was no fieldwork undertaken for this assessment. Field observations and photographic logs were provided by other team members. Previous studies show that a change to the sense of place is probable.

Mitigation

The objectives of mitigation are to:

- **Limit,** where possible, any negative changes in the sense of place, whilst enhancing the positive impacts of such a change;
- **Minimise** the impact of nuisance factors, e.g., vibration, noise, dust, or traffic, during the construction and operation phases; and
- **Manage** the influx of job-seekers.

Specific mitigation measures should include:

- **Transnet** will develop and implement an induction programme, including a Code of Conduct, for all employees and contractors, this will include the following:
 - **Respect** for local residents and customs;

- Zero tolerance of illegal activities by construction personnel including using the services of prostitutes; illegal sale or purchase of alcohol; sale, purchase or consumption of drugs; illegal gambling or fighting;
- No use of project vehicles for non-work business;
- Description of disciplinary measures for infringement of stipulated protocols;
- At a minimum, the legal speed limit should be adhered to; and
- Refer to mitigation measures for traffic, noise and dust as outlined in sections X, Y and Z.

- Transnet will develop and implement a Corporate Social Investment (CSI) Programme that clearly outlines their anticipated initiatives. These initiatives will be identified in consultation with the affected local communities. The plan will outline where projects will be implemented and what the nature of the assistance will be. This strategy will be communicated via the stakeholder engagement plan to ensure that expectations remain realistic and are pro-actively managed. Transnet will initiate the formation of partnerships with relevant government departments (e.g. law enforcement to initiate a community policing forum) to address identified areas of need.

- In order to manage the expectations of potential job-seekers and thus attempt to reduce their numbers, Transnet will advertise the approach to and requirements for employment and procurement throughout the Northern and Eastern Cape Provinces.

- Transnet will establish a stakeholder engagement plan to ensure on-going identification and management of stakeholder issues and concerns. This engagement plan will target residents from all towns. Transnet will appoint a permanent community liaison officer to interact with the communities.

- Transnet will implement a grievance procedure that is easily accessible to local residents, and which allows complaints related to contractor or employee behaviour to be lodged and responded to. Transnet will respond in a serious manner to any such complaints. A grievance register will be maintained by Transnet.

Residual Impact

The construction and operation phase activities will impact on the sense of place of the project area by increasing the nuisance factors associated with the project activities and in-migration. The mitigation measures will best be able to address the project related factors and are less likely to change the factors associated with in-migration. The rating after mitigation could increase from

Table 1.10

Pre- and Post-Mitigation Significance: Sense of Place

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction	MINOR (positive) (Due to increased economic opportunities)	MODERATE (positive)
	MODERATE (negative) (for the elderly and vulnerable)	MODERATE (negative)
Operation	MINOR (positive) (Due positive economic spin-offs)	MINOR (positive)
	MINOR (negative) (for the elderly and vulnerable)	NEGLECTIBLE (negative)

1.7

LAND ISSUES RELATED TO THE PROJECT

The land requirements for the proposed railway upgrade have not yet been defined by Transnet. As such, it was not possible to assess the direct localised impacts of the proposed development on specific land parcels. In this section we reflect on key issues of a general nature regarding this matter. A detailed and nuanced assessment can only be undertaken once the affected land parcels have been identified by Transnet.

Land acquisition is a sensitive process and can have major negative impacts on economic and livelihood activities, as well as on infrastructure. If this process is poorly managed, the potential consequences could be significant. Some of the potential issues related to land matters are outlined below.

- Some of the twenty-nine loop sites may **require additional land** for the construction and extension of the loops. Transnet has indicated that it intends buying land from land owners in order to access the additional land required. This could have an impact on the productivity of the land should the land be farm land. There are numerous land uses and land owners in the project area. At present it is unclear what the land use is of the additional land required as the extent and location of the additional land is not known. The impact of the expropriation of land will vary for the respective land owners.

- The land needed may be subject to **land claims**. This has not yet been confirmed given that Transnet's land requirements have not yet been

finalised. There remains a considerable number (555) of outstanding land claims in the Eastern Cape. While the Northern Cape has settled in excess of 90 percent of its land claims, 212 claims remain outstanding. The majority of the loops are in the Eastern Cape with only six of the total twenty-nine proposed loops located in the Northern Cape. This, therefore, increases the possibility that there may be portions of the project area subject to land claims.

- There are **families living on Transnet land** in old Transnet buildings at Rosmead. It is uncertain whether this situation is repeated elsewhere along the project route. Transnet has rented its buildings at Rosmead to the existing residents, although not all have formal contracts. Should Transnet require that these families relocate, it could have a significant impact on the people occupying the buildings. The impacts of the potential move will also depend on the site where they will be moved to and the services available to them. Previous experience suggests that older people will find it harder to adapt to change should they be required to move.

Proposed Responses to Issues Raised

Once the Transnet corridor (boundaries of the rail reserve) has been clearly defined by the surveyors, Transnet will need to identify the various land uses and the associated land ownership throughout the proposed project area. At that point, it will be necessary to determine the following through further investigation:

- formal and informal economic/livelihood activities on land beyond Transnet's corridor but that will be required for the proposed upgrade;
- formal and informal economic/livelihood activities within the Transnet corridor;
- infrastructure located within the proposed corridor, including rented Transnet buildings; and
- any relevant land claims.

Once these have been clearly identified, mechanisms will need to be put in place for Transnet to acquire and/or rezone the needed portions, or to provide compensation for lost economic and physical resources. The specific impacts and relevant mitigation mechanisms should be defined (potentially with the assistance of an external specialist) and managed in accordance with the law and best practice standards. Three potentially relevant pieces of legislation are:

- The Expropriation Act, No. 63 of 1975 (as amended);
- The Rental Housing Act, No. 50 of 1999; and
- Prevention of Illegal Eviction From and Unlawful Occupation of Land Act, No. 19 of 1998.

Through the engagement process, it became clear that local residents have a range of expectations related both to the proposed project as well as to Transnet. Some of these expectations will be met through the project activities, while others are unlikely to be met. These expectations should be pro-actively managed in order to nurture strong and trusting relationships between Transnet and the project stakeholders. By actively identifying and addressing expectations and concerns the levels of dissatisfaction can be reduced and potential conflict can be avoided or minimised. Some of the expectations and concerns raised are outlined below.

Key Issues

- Many residents of the affected towns anticipate **employment opportunities**, particularly for the youth. In general, community members are not fully aware that the employment opportunities will be limited in number and be of short duration. They consequently anticipate positive economic benefits arising from the project. This perception needs to be managed. There is also an expectation that this project will provide work for ex-Transnet employees living in the towns.
- There is an expectation that people, other than those employed, will receive **training**.
- With limited work opportunities available in the area, migrants could be considered a threat to locals as they would be competing for the same limited resources and job opportunities. Transnet should avoid creating **tensions** between locals and migrants that may result from employing non-local people.
- The temporary nature of jobs during the construction phase can result in the deepening of the **debt burden** on poor households. People who gain employment on the project will be in a position to access credit. Without previous experience of managing a regular income; it is common that debt is incurred to acquire goods and services that were formerly beyond the reach of those now enabled. Once the income stream generated from the project ceases they are unlikely to be able to repay the debt incurred.
- While the **influx of job-seekers** may result in an increase of cultural diversity, it may also increase the potential for conflict as people compete for scarce resources. In the past year South Africa has experienced high levels of xenophobic violence with part of the reasons for the surge of violent attacks being rooted in poor communities competing for limited resources and services with migrants. Attention should, therefore, be paid to the development of tension between locals and migrant job seekers.
- In early 2008 South Africa experienced nationwide power cuts as a result of acute shortages in **electricity supply**. The shortage of electricity

remains a serious concern. A concern raised during the public consultation process was that the increased pressure on electricity supply (by project activities and in-migration) would cause more power cuts.

- Local residents anticipate that Transnet will address some key local **infrastructural needs** as part of its Corporate Social Investment (CSI) Programme. Pressure on existing infrastructure within the project area is caused by a growing population and the lack of improvements in the current infrastructure. Health care and education facilities are poorly maintained and under resourced with respect to personnel and equipment. Access to piped water and sanitation are two other key needs within the communities. Upgrades to infrastructure and services as linked to project activities and CSI programmes would be seen by stakeholders as a major benefit associated with the project should Transnet choose to implement such a programme.

Proposed Responses to Issues Raised

By way of addressing the issues discussed above, Transnet should consider a number of key management responses, as outlined below.

As indicated elsewhere, Transnet should establish a **stakeholder engagement plan** to ensure the on-going identification and management of issues. A range of communication tools can be used to appropriately target issues or communicate general information. Stakeholders should be kept informed about the project activities and timeframes. Information dissemination must be timely, complete and accurate. This engagement plan should target residents from all towns in the project area. Transnet will need to appoint permanent community liaison officers throughout the project area that are able to interact with the communities. The perceptions of stakeholders can change at any time. Consequently, it is important that Transnet continually engage with them in order to remain aware of their attitudes and perceptions. If stakeholders believe that they can communicate effectively with Transnet and that their issues are dealt with appropriately, they are less likely to contact the media, authorities or NGOs with their complaints.

Linked to the stakeholder engagement plan Transnet should implement a **grievance procedure** that is easily accessible to local community members, and which allows complaints related to contractor or employee behaviour to be lodged and responded to. Transnet should respond in a serious manner to any such complaints. A grievance register should be maintained by Transnet.

Local residents' expectations of Transnet will continue to grow over time. It will not be possible for Transnet to deliver on all community and stakeholder expectations; hence a **CSI Programme** should be developed that clearly outlines the anticipated initiatives. These initiatives will need to be identified in consultation with the local communities. The programme should outline what the nature of interventions will be and how the investment projects will be distributed through the project area. This programme should be

communicated to stakeholders / local residents to ensure that their expectations remain realistic and well-managed. Examples of potentially relevant programmes could include community policing, financial management, and the drilling of boreholes.

The concept of 'local' should be clearly defined as many of the mitigation measures and recommendations emphasise the use of local labour, goods/services and benefits to local people. This concept should be defined together with a range of project stakeholders.

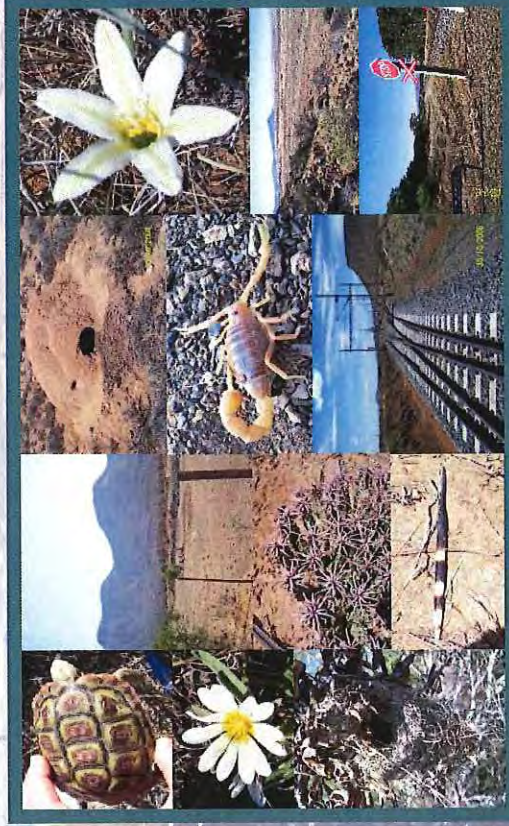
APPENDIX E4:

TERRESTRIAL ECOLOGY ASSESSMENT

Terrestrial Ecological Assessment

TRANSNET RAILWAY LINE EIA

TERRESTRIAL ECOLOGICAL ASSESSMENT



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Terrestrial Ecological Assessment

January 2009

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GLOSSARY OF ACRONYMS, TERMS AND UNITS

AoC	Areas of Concern
ALARP	As low as reasonably practicable
BIT	Biogeographically Important taxon
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Areas
CR	Critically Endangered
DCA	Detrended Correspondence Analysis
DD	Data Deficient
DEAT	Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Forestry
ECBCP	Eastern Cape Biodiversity Conservation Plan
ECCO	Environmental Control Officer
EIA	Environmental Impact Assessment
EN	Endangered
ERM	Environmental Resource Management Southern Africa (Pty) Ltd
ECBCP	Eastern Cape Biodiversity Conservation Plan
EX	Extinct
IEMP	Integrated Environmental Management Programmes
IDP	Integrated Development Plan
UDCN	World Conservation Union
LC	Least Concern
LT	Least Threatened
Med	Valued medicinal plant
NE	Near Endangered
NEPAD	New Partnership for Africa's Development
NSBA	National Spatial Biodiversity Assessment
NBSAP	National Biodiversity Strategy Action Plan
NSS	Natural Scientific Services
NEMA	National Environmental Management Act
NEPAD	New Partnership for Africa's Development
NT	Near Threatened
PP	Protected Plant
PS	Protected Species
QDS	Quarter Degree Squares
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
STBA	Still To Be Assessed
STEP	Subtropical Thicket Ecosystem Planning Initiative
TSP	Threatened Species Programme
VU	Vulnerable

1 INTRODUCTION

Environmental Resource Management Southern Africa (Pty) Ltd (ERM) appointed Natural Scientific Services (NSS) to undertake an Ecological Assessment for the proposed upgrade of the Transnet Railway between Hottazel and the Port of Ngquna in the Eastern and Northern Cape Provinces.

- The Ecological Assessment is split into two phases:
 - Baseline Assessment - an initial overview and brief description of the ecological environment at each of the sites, which was submitted to ERM for comment on the 8 September 2008; and
 - Terrestrial Ecological Assessment (Detailed Assessment) - Focusing on specific sites requiring detailed investigations (excluding trapping) and identifying and assessing impacts associated with the railway development. This phase also identifies mitigation and management measures for the proposed development.

1.1

AIM OF THE TERRESTRIAL ECOLOGICAL ASSESSMENT

The aim of this study is to provide a detailed assessment of the current terrestrial fauna and floral status of the different sites within the study area (Figure 1.1), by:

- Gathering information on the ecological status of the project area through a review of existing and available information;
- Identifying and describing, through selected field investigations, potential sensitive species, habitats or ecological processes that may be impacted by the construction and operational activities (Areas of Concern);
- Assessing potential impacts on fauna, flora and ecological processes from the construction and operation activities;
- Describing mitigation/management measures that may be implemented to avoid or reduce any negative impacts and enhance benefits of the development that can be incorporated into the project design; and
- Outlining any further studies that may be required during.

This report therefore includes:

- A description of the potential ecological sensitivities in and around the loop sites (including sites of associated infrastructure), at the borrow pit sites (new and existing), at the Erml Substation site and along the section of line to be refurbished and electrified between Kimberley and De Aar;
- An assessment of existing impacts and potential ecological impacts at each site (assessed according to significance criteria and methodology provided by ERM);
- A description of relevant and implementable mitigation measures to reduce, avoid, or minimise negative impacts and enhance positive impacts;

- Identification of information gaps, uncertainties, study limitations and underlying assumptions;
- Recommendations, including possible monitoring requirements during the construction phase;
- Glossary and list of definitions; and
- Reference of all information sources.

STUDY AREA

The study area is located in the Northern and Eastern Cape Provinces (Figure 1.1) with the sites for the railway loops, borrow pits, yards and substation falling within the following Municipalities:

- Northern Cape
 - Gamagora (District DC45)
 - Moshaweng (District DC45)
 - Tsantsabane (District DC8)
 - Sol Plaatje (District DC9)
 - Emthanjeni (District DC7)
 - Umsobomvu (District DC7)
- Eastern Cape
 - Inxuba Yethemba (DC13)
 - Blue Crane Route (DC10)
 - Makona (DC10)
 - Sundays River Valley (DC10)
 - Nelson Mandela (NMA)

The sites under investigation are as follows:

Description	Latitude	Longitude
1 Barkly Bridge	-33.62208	25.69616
1.1 Borrow pit Barkley Bridge	-33.66946	25.68153
2 Addo	-33.55512	25.69053
3 Coerney	-33.45914	25.72143
4 Verby	-33.44308	26.01851
5 Eagle's Crag	-33.38400	26.05689
6 Tootabi	-33.35001	26.06897
7 Blinkhoff	-33.24877	25.9928
8 Saltare	-33.17947	25.93965
9 Kommadagga	-33.11853	25.89966
10 Golden Valley	-32.81031	25.78934
10.1 Road borrow pit near Cookhouse	-32.71248	25.81221
10.2 Cookhouse possible borrow pit	-32.73841	25.82719
10.3 Golden Valley possible borrow pit	-32.82803	25.79735
11 Klipfontein	-32.60304	25.76213
11.1 Klipfontein cutting as borrow pit	-32.58495	25.75405
12 Mortimer	-32.36226	25.69168
13 Halesowen	-32.24848	25.68088
14 Marlow	-32.11021	25.58687
14.1 Marlow borrow pit	-32.10451	25.60175
15 Kaptein	-32.04856	25.53296
16 Knutsford	-31.95536	25.50667
16.1 Knutsford borrow pit	-31.95762	25.48624
16.2 Knutsford borrow material	-31.95889	25.51189
17 Visrivier	-31.90487	25.40917
17.1 Visrivier Collett se quarry	-31.92611	25.43351
17.2 Visrivier possible borrow pit (existing)	-31.91552	25.41996
18 Conway	-31.73242	25.30152
18.1 Conway possible borrow Pit	-31.70389	25.27851
19 Glenheath	-31.67899	25.25894
20 Tafelberg	-31.61538	25.24052
21 Rosmead	-31.49010	25.11904
22 Flonker	-31.38297	25.03316
23 Carlon	-31.30505	24.95056
24 Barredeel	-31.22002	24.94696
25 Wildfontein	-31.07201	24.83622
25.1 Borrow pit near Wildfontein	-31.06341	24.81386
25.2 Borrow pit near Wildfontein	-31.04704	24.77151
26 Linde	-30.99132	24.64041
27 Hanover Road	-30.95363	24.54012
27.2 Hanover Road existing borrow pit	-30.95588	24.54479
28 Burgervilleweg	-30.82397	24.29203
29 Bletterman	-30.70928	24.08014
29.1 Bletterman road borrow pit	-30.71311	24.05424
30 Hotazel Yard	-27.21981	22.9663
30.2 HZL Tie in of triangle.	-27.21423	22.96415
31 Mamathwane Yard	-27.39366	22.99488
31.3 Middelplaats take off.	-27.40530	22.99017
32 Postmasburg Yard (including PMG Electrifying line)	-28.30719	23.05147
33 Ronaldsvlei & Beaconsfield Yards	-28.77973	24.75643
34 Emi Substation	-27.69978	22.96696

Figure 1.1 Study Area



Source: Field Points: ERM

2 APPROACH AND METHODOLOGY

2.1

APPROACH

This Terrestrial Ecological Assessment was undertaken using existing sources of information and primary data collected during the initial field investigation (August 2008), the Eastern Cape detailed field investigation (October 2008), and the Northern Cape detailed field investigation (November 2008).

The NSS Team for the ecological component of the study were as follows:

Specialist	Aspect Investigated	Qualifications
Ian Bredin (NSS)	Fauna	MSc (Veterinary Science) Pr.Sc./Nat Registered - Zoology
Lukas Niemand (Technoda)	Flora	M.Sc. (Restoration Ecology/Zoology) Pr.Sc./Nat Registered - Ecological Science & Zoology
Susan Abell (NSS)	Flora & CIS	MSc (Resource Conservation Biology) Pr.Sc./Nat Registered - Ecological Science & Environmental Science
Carren van Dam	Background & CIS Mapping	MSc (Environmental Science) - thesis still to be finalized.

The NSS team has over 25 years combined experience in project management and fieldwork for numerous ecological studies (fauna & flora) and wetland assessments. A number of the team members are registered Professional Natural Scientists in the ecological, environmental and zoological fields.

METHODOLOGY

The methodology for the terrestrial ecological assessment entailed a two phased approach: a scoping assessment in the winter season and a detailed field investigation in the summer season.

Scoping Assessment

The scoping assessment mainly focused on a desktop assessment with a brief visit to most of the sites (access to a few sites was restricted) to undertake an initial broad level scan. The desktop assessment included:

- A review of applicable legislation; and
- A literature review of existing reports and studies, including:
 - the Eastern Cape State of the Environment Report, (2004);
 - the Northern Cape State of the Environment Report, (2004);
 - National Spatial Biodiversity Assessment (2005);
 - Floristic Regions of Endemism (2001);
 - Published data for Red Data fauna species (Friedman and Daly, 2004; Minter *et al.*, 2004; South African Bird Atlas Data Extraction, 2007);
 - Mucuna & Rutherford (2006) - the vegetation map of South Africa, Lesotho and Swaziland;

- Pierce & Mader (2006) – the STEP programme;
- Van Wyk & Smith (2001) – regions of floristic endemism;
- Threatened Species Programme (2007) – IUCN listing for plant taxa as provided by SANBI;

The initial scan included:

- An initial broad site visit (*drive through*) to obtain a visual perspective of the vegetation/habitat types at the different sites, and a broad overview of faunal species throughout the study sites. This was undertaken in August 2008.

2.2.2

Detailed Field Investigations

This phase included two weeks of field investigations within identified habitats within and along the different proposed loops (including associated infrastructure), borrow pit areas, yards and the new substation. The field investigations were undertaken in late October 2008 between the Port of Ngqura and the town of De Aar, and in mid November 2008 to evaluate the sites from the town of De Aar to the town of Holazeel.

The terrestrial flora assessment included:

- A regional overview of the affected study area. In addition to the Scoping Phase the following published literature was also consulted:
 - Mesemb (Mesembryanthemaceae) taxa (gratuitously) determined by Me Priscilla Burgoyne at the Pretoria National Herbarium (PRE), SANBI;
 - Esler, Milton & Dean (2006) – the general ecology specific to the Karoo;
 - Various monographs such as Bayer (1999) – *Haworthia* and Bruyns (2005) – *Stapelias*; and
 - Various field guides with particular reference to Shearing (1994), Manning (2001), Van Rooyen (2001) and Palgrave (2002).
- A site visit to obtain a visual perspective of the vegetation/habitat types at the different sites. This included random transect walks at each loop (or proposed loop), yard and the substation area to ensure sampling of less abundant or localised species, and to assist with the compilation of a species inventory.
- All borrow pits (existing and new) were quantitatively sampled by means of plot-based data collection. Four (4) plots were established at 10 m, 20 m, 50 m and 100 m intervals from the perimeter of existing pits or from the central point indicating a new pit. The sampling plot size was standardised at 100 m². A sample entailed the compilation of a list of plant taxa, where each taxon was assigned an estimate (usually a cover-abundance estimate). A vegetation sample can be seen as a simplified model of the vegetation stand. Therefore, the species composition, as well as the mean percentage cover of each species per sampling plot was measured. Percentage cover was not measured precisely, but was placed

in one of seven categories by a visual estimate as described by Braun-Blanquet (in Mueller-Dombois & Ellenberg, 1974; see Table 2.2.2).

Table 2.2.2 Adapted Braun-Blanquet Cover classes (Mueller-Dombois & Ellenberg, 1974) used during the project

Class	Range of Cover (%)	Mean
5	75-100	87.5
4	50-75	62.5
3	25-50	37.5
2b	12.5-25	18.75
2a	5-12.5	8.75
1	1-5	2.5
♂	Occasional, less than 5	
♀	One or few individuals	

- A TWINSPAN analysis (Hill, 1979) and Detrended Correspondence Analysis (DCA) of cover estimates for the different plant species were used to classify vegetation assemblages. The TWINSPAN analysis is used to assign associations between samples with the aim to objectively delineate groups or assemblages. Therefore, sampling entities that group together (being more similar) are believed to have similar compositions. Data was left untransformed to allow for only common or dominant species to participate in the analysis. The software package JUICE ver. 6.5.2 (Tichý L., Inst of Botany and Zoology, Masaryk Univ., Brno, Czech Rep, 1999-2007) was used during the analysis; and
- The percentage contribution (%) of each plant taxon within each vegetation grouping was calculated according to Clarke & Warwick (1994). Those species with high consistencies and percentage contributions were considered to be typical (or representative) for the given assemblage.

In addition, the following parameters were also documented to aid the vegetation survey:

- All plant taxa were identified to species level. Scientific names follow Germishuizen & Meyer (2003);
- The growth form of each plant species (a measure of structural diversity) and an indication of its perennality;
- A survey of Red Data and endemic plant taxa;
- The identification of plant species protected by provincial and national legislation;
- A survey of plant species with medicinal or cultural value; and
- The identification of declared weeds and invader species as promulgated under the amended regulations (Regulation 15) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).

The terrestrial faunal assessment included:

- Walking the sites and noting habitat types and the visual presence of animals or evidence of animals in the form of faeces, pellets, spoor, nests, burrows, feathers etc;
- A description of fauna linked to each habitat and possible occurrence of endemic, Red Data / protected species;
- Identifying Areas of Concern through ranking of each site based on species diversity, species richness and the presence of Red Data / protected species; and
- Identification and assessment of potential impacts and recommendations on management and mitigation measures (discussed in Section 2.4 and 2.5).

A broad site visit (*drive through*) was undertaken for the assessment of fauna and flora along the 230km section between De Aar and Kimberley.

ECOLOGICAL IMPORTANCE

The ecological sensitivity of any piece of land is based on its inherent ecosystem service (e.g. ridge systems) and overall preservation of biodiversity. It therefore relates to:

- Species diversity, endemism (unique species or unique processes) and the high occurrence of threatened and protected species or ecosystems protected by legislation – *conservation importance*; and
- The degree of ecological connectivity between systems within a landscape matrix. Thus, systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive – *ecological function*.

2.3.1

Sensitivity Scale

- **High** – Sensitive ecosystems with either low inherent resistance or low resilience towards disturbance factors or highly dynamic systems considered being important for the maintenance of ecosystem integrity. Most of these systems represent ecosystems with high connectivity with other important ecological systems OR with high species diversity and usually provide suitable habitat for a number of threatened or rare species. These areas should be protected.
- **Medium** – These are slightly modified systems which occur along gradients of disturbances of low-medium intensity with some degree of connectivity with other ecological systems OR ecosystems with intermediate levels of species diversity but may include potential ephemeral habitat for threatened species; and
- **Low** – Degraded and highly disturbed/transformed systems with little ecological function and are generally very poor in species diversity (most species are usually exotic or weeds).

2.4

IMPACT ASSESSMENT METHODOLOGY (PROVIDED BY ERM)

The assessment of impacts includes the determination of the following:

- The nature of the impact – Table 2.4a;
- The magnitude (or severity) of the impact – Table 2.4b; and
- The likelihood of the impact occurring – Table 2.4b

The degree of confidence in the assessment will also be reflected.

Table 2.4.a

Impact assessment terminology

Term	Definition
Impact nature	
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g. in-migration for employment placing a demand on resources).
Cumulative impact	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

2.4.1

Assessing significance

There is no statutory definition of 'significant' and its determination is, therefore, somewhat subjective. However, it is generally accepted that significance is a function of the magnitude of the impact and the likelihood of the impact occurring. The criteria used to determine significance are summarised in Table 2.4b.

Table 2.4b

Significance criteria

Impact magnitude	Extent	Duration
<i>On-site</i> – impacts that are limited to the boundaries of the tail reserve, yard or substation site.	<i>Local</i> – impacts that affect an area in a radius of 20km around the development site.	<i>Temporary</i> – impacts are predicted to be of short duration and intermittent/occasional.
<i>Regional</i> – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries; habitat type/ecosystem.	<i>National</i> – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.	<i>Short-term</i> – impacts that are predicted to last only for the duration of the

Table 2.4d

Significance definitions

An impact of negligible significance (or an insignificant impact) is where a resource or receptor (including people) will not be affected in any way by a particular activity, or the predicted effect is deemed to be 'negligible' or 'imperceptible' or is indistinguishable from natural background variations.

An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value.

An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that 'moderate' impacts have to be reduced to 'minor' impacts, but that moderate impacts are being managed effectively and efficiently.

An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors such as employment, in coming to a decision on the Project.

Negligible significance	An impact of negligible significance (or an insignificant impact) is where a resource or receptor (including people) will not be affected in any way by a particular activity, or the predicted effect is deemed to be 'negligible' or 'imperceptible' or is indistinguishable from natural background variations.
Minor significance	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that 'moderate' impacts have to be reduced to 'minor' impacts, but that moderate impacts are being managed effectively and efficiently.
Major significance	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors such as employment, in coming to a decision on the Project.

Once the significance of the impact has been determined, it is important to quantify the degree of confidence in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence can be expressed as low, medium or high.

2.5

MITIGATION AND RESIDUAL IMPACTS

Suitable and practical mitigation measures will be recommended for identified significant impacts. If required a workshop could be held to discuss mitigating measures with ERM and the client.

Residual impacts are those impacts which remain once the mitigation measures have been designed and applied. Once the mitigation is applied, each impact is re-evaluated (assuming that the mitigation measure is effectively applied) and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

2.6

LIMITATIONS OF THE STUDY

Biodiversity/ecological studies are usually constrained by resources such as surveying time and duration, financing and support, which are all interrelated. A complete census of an area is only feasible if:

	construction period. <i>Long-term</i> - impacts that will continue for the life of the Project, but ceases when the Project stops operating. <i>Permanent</i> - impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
	BIOPHYSICAL ENVIRONMENT: <i>Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie. habitats, species or communities).</i> Negligible - the impact on the environment is not detectable. Low - the impact affects the environment in such a way that natural functions and processes are not affected. Medium - where the affected environment is altered but natural functions and processes continue, albeit in a modified way. High - where natural functions or processes are altered to the extent that it will temporarily or permanently cease.
	<i>Where appropriate, national and/or international standards are to be used as a measure of the impact. Specialist studies should attempt to quantify the magnitude of impacts and outline the rationale used.</i>
Intensity	SOCIO-ECONOMIC ENVIRONMENT: <i>Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the Project.</i> Negligible - there is no perceptible change to people's livelihood Low - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. Medium - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support High - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.
	Impact likelihood (Probability)
	Negligible - The impact does not occur.
	Low - The impact may possibly occur.
	Medium - Impact is likely to occur under most conditions.
	High - Impact will definitely occur.

Once a rating is determined for magnitude and likelihood, the following matrix can be used to determine the impact significance (Table 2.4c).

Table 2.4c

Example of significance rating matrix

	SIGNIFICANCE RATING			
LIKELIHOOD	Negligible	Low	Medium	High
Negligible	Negligible	Negligible	Low	Low
Low	Negligible	Negligible	Low	Low
Medium	Negligible	Low	Medium	Medium
High	Low	Medium	High	High

In Table 2.3d, the various definitions for significance of an impact are given.

- the target population is small;
- measurement is not destructive;
- the study area is small and well delineated; and
- you have unlimited resources.

Data Limitations

There were limitations in the data available for each site as most information i.e. the Conservation and Environmental Plans were at a National, Provincial or Municipal level. It must be mentioned that very little data was available for the Northern Cape Province. (i.e. no C-Plan data was available).

Field Limitations

The study area (all 51 sites throughout the Eastern and Northern Cape) was considerable in extent and therefore the detailed investigations included field assessments at each site that ranged from 30 minutes to 2 hours in duration. Time spent at each site was restricted due to the number of sites to survey and the required distance to travel between them.

No trapping was undertaken at any of the sites, therefore the assessment of small mammals (i.e. rodents) and herpetofauna was limited to a broad assessment (desktop analysis and field observations where possible). In addition, the number of species recorded was restricted by the amount of time spent at each site.

In order to obtain a comprehensive understanding of the dynamics of the floristic communities on the study site, as well as the status of endemic, rare or threatened species in any area, vegetation assessments should always consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints such long-term studies were not feasible. It should also be mentioned that one of the proposed borrow pits were not accessible (e.g. site 10.3 – Golden Valley) during the survey due to biosecurity reasons. The borrow pit could be seen from a distance (approximately 200m) and vegetation in the general vicinity was assessed.

3 IDENTIFICATION OF APPLICABLE POLICIES, LEGISLATION, STANDARDS AND GUIDELINES

3.1 INTERNATIONAL LEVEL

3.1.1 CONVENTION ON BIOLOGICAL DIVERSITY.

The Convention is the first global, comprehensive agreement to address all aspects of biological diversity: genetic resources, species, and ecosystems. It recognizes - for the first time - that the conservation of biological diversity is "a common concern of humankind" and an integral part of the development process.

3.1.2 THE RAMSAR CONVENTION.

Over the years the Convention has broadened its scope of implementation to cover all aspects of wetland conservation and wise use, recognizing all wetlands as ecosystems that are extremely important for biodiversity conservation and for the well-being of human communities. South Africa is a contracting party to the Ramsar Convention with 19 internationally recognized Ramsar sites.

3.1.3 THE BORN CONVENTION (ON CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS)

This convention aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. South Africa is a party to this convention.

3.1.4 THE WORLD HERITAGE CONVENTION.

The most significant feature of the 1972 World Heritage Convention is that it links together the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the fundamental need to preserve the balance between the two.

3.1.5 THE IUCN (WORLD CONSERVATION UNION).

The Union's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

3.2

REGIONAL LEVEL

3.2.1 *The Action Plan of the Environmental Initiative of NEPAD (the New Partnership for Africa's Development), 2003.*

This initiative encourages sustainable development and associated conservation and wise use of biodiversity.

3.3

NATIONAL LEVEL

3.3.1 *National Environmental Management Act (No. 107 of 1998) (NEMA)*

NEMA can be regarded as the most important piece of general environmental legislation covering three main areas namely: Land, planning and development; Natural and cultural resources use and conservation; Pollution control and waste management. The objective of NEMA is to provide for cooperative environmental governance through a series of principles. Principles relevant to this chapter include:

- Sustainable development requires the consideration of all relevant factors including:
- that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource; and
- that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised.
- Sensitive, vulnerable, highly dynamic or stressed ecosystems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

3.3.2

National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

Although South Africa became a signatory to the Convention of Biological Diversity in 1998, the enactment of recent national legislation has affirmed our countries commitment to biodiversity and conservation. The National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) has been assented by the South African President and was published in the Government Gazette in June 2004 (Vol. 467, No. 26426). One of the objectives of this Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and to ensure the sustainable use of indigenous biological resources.

3.3.3

National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations

Chapter 4, Part 2 of NEMA Biodiversity Act, 2004 (Act No. 10, 2004) provides for listing of species that are threatened or in need of protection to ensure their survival in the wild, while regulating the activities, including trade, which may involve such listed threatened or protected species and activities which may have a potential impact on their long-term survival. In February 2007, this was achieved as the Minister of Environmental Affairs and Tourism published a list of CR, EN, VU and Protected Species (PS), according to Section 56(1) of the Act.

3.3.4

Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)

In 1984, regulations were passed in terms of the Conservation of Agricultural Resources Act (CARA) regulations declaring about 50 species "weeds" or "invader plants". On 30 March 2001 the Minister of Agriculture promulgated an amendment to these regulations. This amendment now contains a comprehensive list of species that are declared weeds and invader plants dividing them into three categories. These categories are as follows:

- Category 1: Declared weeds that are prohibited on any land or water surface in South Africa. These species must be controlled, or eradicated where possible.
- Category 2: Declared invader species that are only allowed in demarcated areas under controlled conditions and prohibited within 30m of the 1:50 year floodline of any watercourse or wetland.
- Category 3: Declared invader species that may remain, but must be prevented from spreading. No further planting of these species are allowed.

In terms of the amendments to the regulations under the Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983), landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the Departments of Agriculture, Environmental Affairs and Tourism (DEAT), and DWAF, as well as other laws (including local by-laws) spell out the fines, terms of imprisonment and other penalties for landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners cost and risk.

3.3.5

National Forests Act, 1998 (Act No. 84 Of 1998)

One of the objectives of this Act is to provide special measures for the protection of certain forests and tree species and to promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes. In terms of section 15(1) of the National Forests

Act, 1998, forest trees or protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by the Department of Water Affairs and Forestry (or a delegated authority).

Therefore a Government Notice was issued in 2005 listing the protected trees within the borders of South Africa [Notice No. 767 Notice of List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 Of 1998) 5 August 2005]. The criteria used to select tree species for inclusion in the protected tree list were:

- Red List Status (rare or threatened species);
- Keystone Species Value (whether species play a dominant role in an ecosystem's functioning);
- Sustainability of Use (whether a species is threatened by heavy use of its products such as timber, bark etc);
- Cultural or Spiritual Importance (outstanding landscape value or spiritual meaning attached to certain tree species); and
- Other Legislation (whether a species is already adequately protected by other legislation).

3.3.6 National Spatial Biodiversity Assessment (NSBA)

The National Spatial Biodiversity Assessment (NSBA) was completed in 2004 and its main focus was on mainstreaming biodiversity priorities throughout the economy, and making links between biodiversity and socio - economic development. It is the first ever comprehensive spatial assessment of biodiversity throughout the country and has four components, dealing with the terrestrial, freshwater, estuarine and marine environments.

There are several possible approaches to biodiversity planning. The approach used most often in South Africa, including in the NSBA, is systematic biodiversity planning. It is based on three key principles:

- The need to conserve a representative sample of biodiversity pattern, such as species and habitats (the principle of representation).
- The need to conserve the ecological and evolutionary processes that allow biodiversity to persist over time (the principle of persistence).
- The need to set quantitative biodiversity targets that tell us how much of each biodiversity feature should be conserved in order to maintain functioning landscapes and seascapes.

3.3.7 National Biodiversity Strategy Action Plan (NBSAP) (DEAT 2005)

Five main strategic objectives have been identified in the NBSAP, namely:

- **Strategic Objective 1:** An enabling policy and legislative framework integrates biodiversity management objectives into the economy.
- **Strategic Objective 2:** Enhanced institutional effectiveness and efficiency ensures good governance in the biodiversity sector.

- **Strategic Objective 3:** Integrated terrestrial and aquatic management across the country minimizes the impacts of threatening processes on biodiversity, enhances ecosystem services and improves social and economic security.
- **Strategic Objective 4:** Human development and well-being is enhanced through sustainable use of biological resources and equitable sharing of the benefits.
- **Strategic Objective 5:** A network of protected areas conserves a representative sample of biodiversity and maintains key ecological processes across the landscape and seascape.

3.4 PROVINCIAL AND MUNICIPAL LEVEL

3.4.1 Subtropical Thicket Ecosystem Planning (STEP) initiative

The STEP Project encompasses the south-eastern Cape region, extending from the Kei River to Riversdale. The project's aim was to assess the region's biodiversity in terms of the diversity of indigenous plants and animals and the processes that sustain them with special emphasis on the unique, indigenous vegetation type known as Thicket. The main objectives from the initiative were to

- Ensure the persistence of biodiversity by developing a co-operative strategy for conserving corridors of land along major river valleys and the coast (the Mega-conservancy Network) which were identified as needing special safeguarding.
- Ensure the retention of biodiversity by categorizing those areas not contained within the Network into areas of conservation status with guidelines for appropriate land use.

3.4.2 Eastern Cape Biodiversity Conservation Plan (ECBCP)

The ECBCP is a broad-scale biodiversity plan. It integrates other existing broad-scale biodiversity plans in the Province, and fills in the gaps using mainly national data. This plan identifies Critical Biodiversity Areas (CBAs). These are terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning.

Eastern Cape Cacadu Integrated Development Plan

The role of an Integrated Development Plan (IDP) is to facilitate local governments' planning and municipal management. A number of opportunities to integrate biodiversity management and conservation with sustainable development have been identified within the Cacadu IDP. These include:

- Consolidation and expansion of protected areas through links with communities and land owners
- Opportunities to engage with production sectors to develop ecologically sustainable land use management practices

- 3.4.4
- Carbon sequestration - i.e. Restoration of degraded areas by planting spekboom (*Portulaca afra*), which is a characteristic of the Cacadu district
 - Alien vegetation clearing programmes linked to improved catchment management
- Eastern Cape: Cacadu Spatial Development Framework**
- The Spatial Development Framework (SDF) for the Cacadu District is guided by the Subtropical Thicket Ecosystem Planning (STEP) initiative / project. Details provided above. The environmental guidelines as recommended by the STEP project have been included into the District wide SDF from a regional perspective.
- 3.4.5
- Eastern Cape: Chris Hani District Municipality IDP**
- The Chris Hani District Municipal IDP contains developmental focus areas that are as follows:
- Sustainable Economic development;
 - Integrated infrastructure development; and
 - Social sustainability.
- These objectives will be realized by the strategies such as
- Environmental sustainability through careful planning and protection by managing grazing land; planning woodlots and conserving sensitive areas.
- 3.4.6
- Northern Cape Nature & Environmental Conservation Ordinance 19 of 1974**
- The Nature & Conservation Ordinance was developed to consolidate and amend the laws relating to nature and environmental conservation, and to provide for matters incidental thereto (DTEC, 2004). This Ordinance established the Department of Nature as well as an Environmental Conservation and Advisory Committee. It is also divided to cover nature reserves, miscellaneous conservation measures, protection of wild animals other than fish, protection of rhinoceroses, protection of fish in inland waters, protection of flora and professional hunters and hunting contractors. Under section 82 of the Ordinance, the Administrator has the power to effect provincial regulations.
- 3.4.7
- Northern Cape: Frances Baard District Municipality 2006-2007**
- Council of Frances Baard District municipality adopted Key Performance Areas for their 2006-2007 IDP which included- ensuring a healthy and safe environment as well as environmentally aware community.
- 3.4.8
- Northern Cape: Kgalagadi District Municipality IDP**
- The IDP for the Kgalagadi District Municipal Area indicated certain shortfalls including the lack of Integrated Environmental Management Programmes for the four municipalities

- 3.4.9
- Northern Cape: Kgalagadi District Municipality SEA and IEMP**
- The District Municipality conducted a Strategic Environmental Assessment and Integrated Environmental Management Programmes in June 2005. These programmes are intended to contribute to a sustainable environment by ensuring that environmental issues are adequately addressed and the impacts of envisaged development projects on the environment are limited.

- 3.4.10
- Northern Cape: Kgalagadi District Municipality SDF**
- The Spatial Development Framework (SDF) for the Kgalagadi District is guided by the District Municipality's Strategic Environmental Assessment and Integrated Environmental Management Programmes.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT -
BIOPHYSICAL ENVIRONMENT

4.1

CLIMATE

The existing railway line runs from the Hotazel, which lies inland near the greater Karoo, south towards the coast near Port Elizabeth. The climate across the length of the existing railway line varies from the dry and arid Northern Cape to the wetter coastal region of the Eastern Cape.

4.1.1

Rainfall

Rainfall levels tend to be much lower in the western regions of South Africa where as the eastern and coastal regions have a higher annual rainfall (Figure 4.1.1).

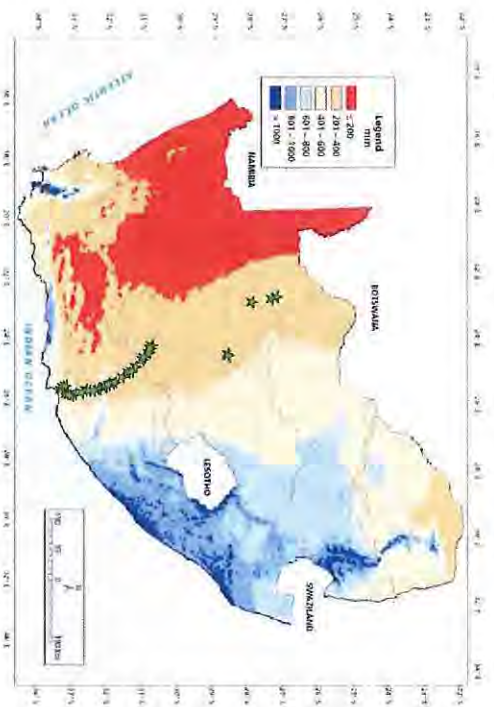


Figure 4.1.1 Regional annual rainfall variations across South Africa (Google images)

(Source: Food and Agricultural Organisation of the United Nations, 2008)

The upper sections of the railway line lie in the eastern regions of the Northern Cape Province. The eastern regions of the Northern Cape have a summer rainfall and commonly experience afternoon thunderstorms. This area can receive up to 400mm of rainfall annually, however rainfall varies greatly between years with some years receiving as little as 200mm. Cold winter evenings often result in the formation of dew and frost in the early

4.1.2

Temperature

mornings which helps supplement the low rainfall. The detailed field investigation for the terrestrial ecological assessment was undertaken in mid November 2008. Although the study was conducted at the beginning of the summer rain season limited rain had already fallen in the region. The study was conducted over a considerable area at relatively small sites and therefore the effect of the limited rainfall was minimal.

The Eastern Cape has a winter rainfall along the coast and a summer rainfall inland. Along the coast rainfall is approximately 600mm per annum but as the altitude changes inland the rainfall drops to approximately 400mm per annum. The limited rainfall and infrequent frost provides ideal conditions for the development of fynbos and thickets. The detailed field investigations were conducted in late October, 2008. This was after the winter rain season for the Eastern Cape and was seen as an optimum time to conduct the study.

The Northern Cape is a semi-desert region with fluctuating temperatures. In summer temperatures have been known to exceed 40°C but most summer maximum temperatures are closer to 30°C. In winter the daily average temperature is approximately 15°C and in the evenings temperatures can drop below 0°C resulting in frost and dew in the early mornings (South African Weather Service, 2008). The variety in climate from hot summers to cold winters, where temperatures can drop to below zero, limits vegetation growth to Karoo and thornveld vegetation.

The southern areas of the Eastern Cape have a mild, temperate, coastal climate with an average of 7 to 8 sunshine hours a day. The summer temperatures vary between 18°C and 25°C while the winter temperatures vary between 9°C and 20°C (South African Weather Service, 2008). These conditions encourage the growth of riverine thickets along the coastal regions and thornveld occurs in the wider flood plains (Mucina & Rutherford, 2006). The climate becomes more extreme as you move inland away from the Indian Ocean. The increase in altitude results in temperature ranges from 5°C to 35°C. Topological differences cause great climate differences from the coastal regions inland to the great Karoo (South African Weather Service, 2008). Grasslands and veld are encountered and then Karoo vegetation develops as you move further inland. The changes in vegetation types provides for different habitats.

4.2

GEOLOGY & SOIL

The geology has been roughly divided into regions with similar characteristics along the length of the line. These are listed below (Council for Geosciences, 1986; De Jong, et al, 2008):

- The section of line between Hotazel and Sishen is located entirely on geology of the Kalahari Group which is comprised of Aeolian sands and limestone. The sands lead to the development of parallel sand dunes which results in the very sparse vegetation comprising of mainly grasses and

- open shrubland. Aeolian sands can be as deep as 1.2m and are able to support larger vegetation such as the Kathu Bushveld;
- From the Sishen to Harts River the railway line is primarily underlain by geology of the Transvaal Supergroup, although there is a small section of Quaternary geology of the Kalahari Group immediately east of Postmasberg. The Transvaal Supergroup rocks are comprised of dolomite, limestone, cherts, jaspilite and andesites, whilst the Kalahari Group geology is comprised of Aeolian sands and limestone (Figure 4.2a);
- The portion of the line from Harts River to Barkly West is underlain by geology of the Ventersdorp Supergroup, which is comprised of basalts and andesites;
- From Barkly West to De Aar the geology is made up of the Ecca Group Shales which were developed during the Paleozoic period;
- From De Aar to Kommadagga the line is primarily underlain by geology of the Beaufort Group with doleritic intrusions. This geology is comprised of mudstones, sandstones and arenite;
- Between Kommadagga and Paterson, where the line crosses the Suurberg mountain range, the project area is underlain by sedimentary rocks (quartzite and shales) from the Cape Supergroup. Soils are either sandy (developed from quartzite) or acidic clay-loam (developed from shales); and finally
- Between Paterson and Port Elizabeth, the geology is comprised mainly of mudstones and limestones of the Algoa, Uitenhage and Witteberg groups which developed during the Paleozoic period (Figure 4.2b). Mudstones result in the development of heavy soils due to the high clay content. These soils are able to support dense vegetation such as the Sundays and Kowie Thicket. As the line moves closer to the coast, more shale and sand occurs supporting less dense vegetation such as riverine thicket, thornveld and fynbos.

4.3

TOPOGRAPHY

The topography of the project area is largely dominated by the semi arid Karoo basin in the Northern Cape and much of the Eastern Cape, as well as the sub-escarpment and coastal areas of the Eastern Cape. The terrain through which the existing railway line runs is, therefore, predominantly quite flat, with exception of those sections of the line that traverse the Cape Fold mountains and the escarpment north of Paterson and south of Cradock (De Jong, *et al.*, 2008).

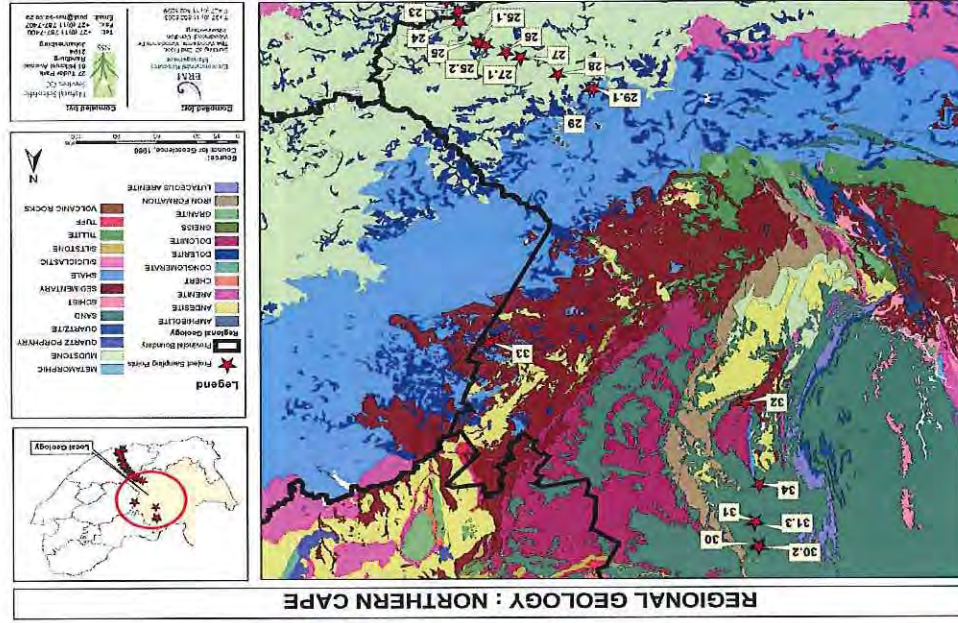
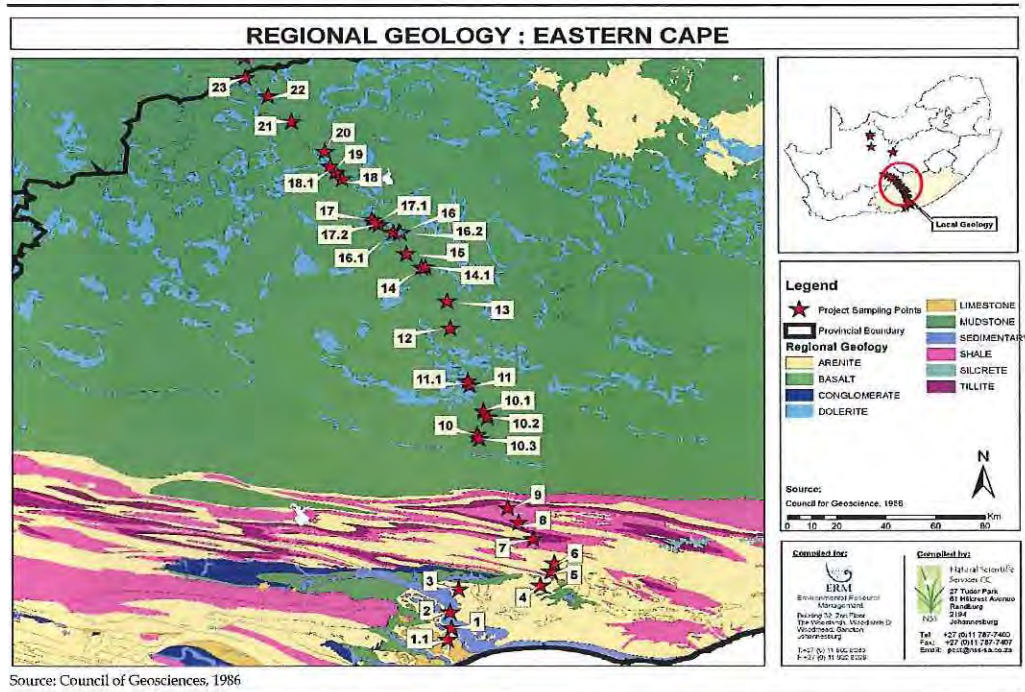


Figure 4.2a Regional geology of the Northern Cape

Figure 4.2.2 Regional geology of the Eastern Cape



Source: Council of Geosciences, 1986

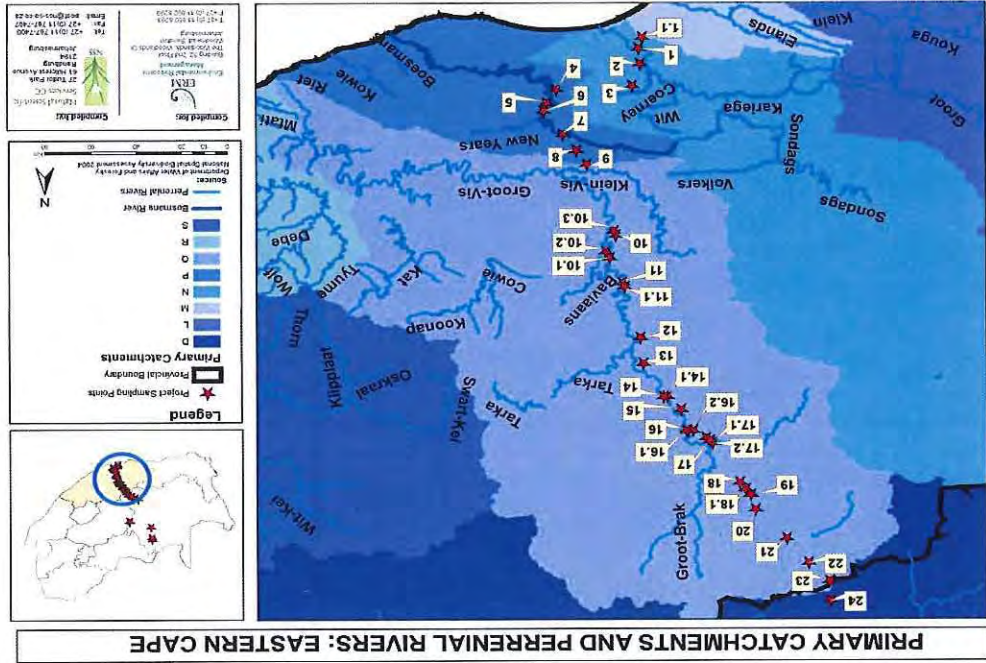
HYDROLOGY

The existing railway line, along which the proposed upgrades, refurbishments and developments will occur, runs in a southerly direction from Hotazel towards Postmasburg, crossing a number of tributaries of the Ga-mogara River before heading in an easterly direction, crossing the Klein Riet, Steenbok, Harts and Vaal Rivers, before arriving in Kimberley (Figure 4.4b). From Kimberley, the railway line runs south south west, crossing the Riet River, the Orange River and the Hondobhalepsvut, en-route to De Aar, before crossing the provincial border between the Northern and Eastern Cape near Carleton. From there, the line runs in a south easterly direction towards Cradock before following the Noupoortspruit, the Groot and Klein Brak, Great Fish, Boesmans and Sunday's Rivers in a generally southerly direction to the Port of Ngquna and Port Elizabeth (Figure 4.4b; De Jong, et al., 2008).

Rivers in the Northern Cape exist in a range of impacted conditions from largely natural with few negative impacts, to largely modified with extensive negative impacts (NSBA, 2004). The Orange River and the Vaal River in the Northern Cape are both largely modified and exist in a Critically Endangered condition. Rivers in Eastern Cape are classified as being either moderately modified or largely modified. The conservation status of rivers in the Eastern Cape varies from Endangered to Critically Endangered (NSBA, 2004).

One particular river of concern is the Boesmans River. It is a perennial river which starts in the Cape Fold Mountains and flows into the Southern Eastern Coastal Hinterland (Figure 4.4b). This river exists in a largely modified condition and is identified as being critically endangered. According to the National Spatial Biodiversity Assessment (2004) "Critically Endangered ecosystems have lost so much of their original natural habitat that ecosystem functioning has broken down and species associated with the ecosystem have been lost or are likely to be lost." Therefore, any remaining natural habitat must be protected and conserved to ensure that species associated with this system are not threatened further. An existing railway line currently runs along the riparian zone of the Boesmans River. It is intended that a new railway loop (Site 6 Tootab) will run along the existing track. The construction of the proposed new railway loop should be restricted to the current railway reserves to minimize the potential future impact. Precautions will need to be taken to prevent any additional degradation to the already fragile river ecosystem (De Jong, et al., 2008).

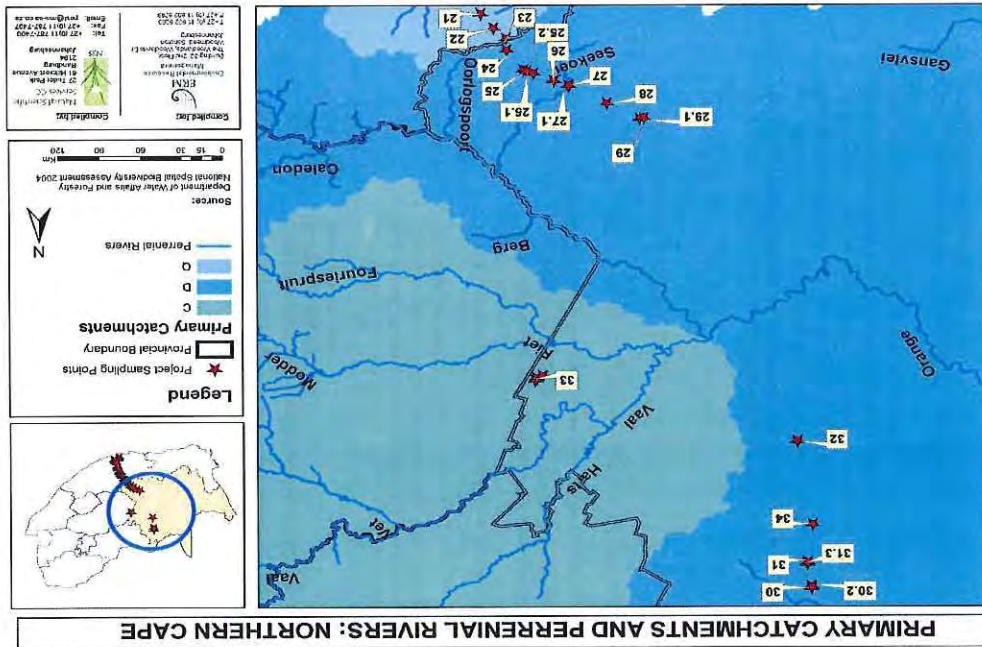
Source: DWAF 2004.



PRIMARY CATCHMENTS AND PERENNIAL RIVERS: EASTERN CAPE

Figure 4.4b Primary catchments and perennial rivers which occur in the Eastern Cape near the railway line

Source: DWAF 2004.



PRIMARY CATCHMENTS AND PERENNIAL RIVERS: NORTHERN CAPE

Figure 4.4a Primary catchments and perennial rivers which occur in the Northern Cape near the railway line.

As part of the NSBA, a terrestrial assessment was conducted nationally utilising the SANBI vegetation map for South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2004) as the main habitat layer. The main products of this terrestrial component included the status of as well as the protection levels of terrestrial ecosystems (Figure 4.5g).

Utilizing the SANBI vegetation map (Mucina & Rutherford, 2006), the study area falls within 13 different vegetation types (Figure 4.5a - Figure 4.5f). These are as follows:

4.5.1

Coega Bonteveld

This vegetation type is found on moderately undulating plains, where a mosaic of low thicket (2-3 m) occurs. Furthermore, secondary open grassland occurs over wide stretches. This unit is often restricted to 'islands' in a matrix of typical valley thicket. The species present are a mixture of Fynbos, Grassland and Succulent Karoo elements. Key species within this vegetation type are listed in Table 4.5.1. According to the STEP programme, the vegetation type is considered as the Grass Ridge Bonteveld.

Table 4.5.1

Important flora species of the Coega Bonteveld vegetation types

Grassland Fynbos	Coega Bonteveld
Succulent	<i>Aloe africana</i> , <i>Aloe ferox</i> .
Trees:	
Small Trees:	<i>Schofia alfa var. alfa</i> , <i>Sideroxylon inerme</i> .
Tall Shrubs:	<i>Euclea undulata</i> , <i>Carissa bispinosa subsp. bispinosa</i> , <i>Dovyalis caffra</i> , <i>Ehretia rigida</i> , <i>Euclea crispata</i> , <i>Gymnosporia capitata</i> .
Low Shrubs:	<i>Helichrysum anomala</i> , <i>Jamestownia microphylla</i> , <i>Tephrosia capensis var. acutifolia</i> , <i>Acmaeda obtusata</i> , <i>Agathosma capensis</i> , <i>Asparagus falcatus</i> , <i>Asparagus multiflorus</i> , <i>Asparagus striatus</i> , <i>Bispharia capensis</i> , <i>Crassula expansa</i> , <i>Ruscusia hannaia</i> , <i>Aloe arborescens</i> , <i>Carpobrotus edulis</i> , <i>Crassula capitata subsp. capitata</i> , <i>Crassula ericoides</i> , <i>Crassula perforata</i> , <i>Oryzis compressa</i> .
Succulent	
Shrubs:	
Semiparasitic	
Shrubs:	<i>Peltargonium petatum</i> , <i>Sarcosemma viminalis</i> .
Woody	
Succulent	
Climbers:	
Woody	<i>Asparagus racemosus</i> , <i>Jasminum angulare</i> , <i>Rhothocarpus capensis</i> , <i>Rhoicissus digitata</i> .
Climbers:	<i>Kedrostis capensis</i> .
Herbaceous	
Climber:	
Graminoids:	<i>Aristida diffusa</i> , <i>Cynodon dactylon</i> , <i>Cynodon incompletus</i> , <i>Eriostachys paspaloides</i> , <i>Heteropogon comotus</i> , <i>Mercenellera fistulata</i> , <i>Panicum maximum</i> , <i>Setaria sphaecelata</i> , <i>Stipa dregana</i> , <i>Themeda triandra</i> , <i>Mesembryanthemum altonis</i> .
Succulent	
Herbs:	
Geophytic	<i>Sansevieria hyacinthoides</i> , <i>Bulbine favosa</i> , <i>Bulbine inamarziarum</i> , <i>Moraea pallida</i> , <i>Oxalis smilithiana</i> .
Herbs:	<i>Aizoon rigidum</i> , <i>Gazania krebsiana</i> , <i>Hypoestes aristata</i> , <i>Indigastrium costatum subsp. macrocarpum</i> , <i>Senecio burchellii</i> , <i>Sulzeria campanulata</i> .

Source: Mucina & Rutherford (2006)

The following sites within the study area that are found in this vegetation type are (Figure 4.5a):

- Site 1.1 Borrow pit Barkley Bridge

4.5.2

Sundays Thicket

This vegetation type is located on undulating plains and low mountains and foothills covered with tall, dense thicket, where trees, shrubs and succulents are common, with many spinescent species. The local dominance of *Portulacaria ifra* increases and the relative abundance of woody species present decreases with increasing aridity. According to Mucina & Rutherford (2006) there is considerable structural heterogeneity within this vegetation unit. Key species within this vegetation type are listed in Table 4.5.2.

According to the STEP programme, this vegetation type is considered as the Sunday's Spektboom Thicket.

Table 4.5.2

Important flora species of the *Sumidays Thicket* vegetation type

Vegetation Type	<i>Sumidays Thicket</i>
Succulent Trees:	Aloe africana, Pappea capensis, Schotia afra var. afra.
Small Trees:	Euclea undulata, Olea europaea subsp. africana.
Lean Shrubs:	Pentzia globosa.
Succulent Shrubs:	Crassula ovata, Euphorbia caeruleus, Euphorbia ledienii, Portulacaria afra, Pelargonium pellatum.
Woody Succulent Climbers:	Aristida adscensionis, Aristida congesta, Cynodon dactylon, Cynodon incompletus, Eragrostis obtusa, Panicum maximum, Tragus berteronianus.
Graminoids:	Senecio radicans, Bulbine frutescens, Drimia intricata, Sansevieria hyacinthoides.
Succulent Herbs:	
Geophytic Herbs:	
Source:	Mucina & Rutherford (2006)

The following sites within the study area that are found in this vegetation type are (Figure 4.5a):

- Site 1 Barkley Bridge
- Site 3 Coenney

4.5.3

Kowitz Thicket

This vegetation type is found. Key species within this vegetation type are listed in Table 4.5.

According to the STEP programme, there are two municipal level vegetation types within the Kowitz Thicket. These are the Shamwari Grass Thicket and the Salem Karroid Thicket.

Table 4.5.3

Important flora species of the *Kowitz Thicket* vegetation type

Vegetation Type	<i>Kowitz Thicket</i>
Succulent Trees:	Euphorbia granulidens, E. Tetragona, E. Trimigularis.
Small Trees:	Schotia afra var. afra.
Tall Shrubs:	Azimia tetracontina, Croton rivularis, Gymnosporia polyantha, Scitua myrtina.
Low Shrubs:	Asparagus striatus, Chrysocoma ciliata, Galenia secundata.
Succulent Shrubs:	Aloe mtoransens, Crassula cultirata, Portulacaria afra.
Woody Succulent Climbers:	Pelargonium pellatum, Sarcostemma thimbalae
Woody Climbers Herbaceous Climbers:	Capparis sepiaria var. citrifolia, Plumbago articulata, Acharia trigoides, Cynanchum ellipticum.
Graminoids:	Cynodon dactylon, C. incompletus, Cyperus albostratus, Eriharta erecta, Eragrostis aurea, Karoochloa curran, Panicum deustum, Setaria sphacelata, Sporobolus fimbriatus, Themusa trimidra.
Herbs:	Achyranthes aspera, Commelina benghalensis, Hypoxites

Vegetation Type**Kowitz Thicket**

aristata, Leidesia procumbens,
Succulent Herbs: *Plectranthus grandidentatus.*
Geophytic Herbs: *Sansevieria aethiopicans, S. Hypocinthoides.*
Source: Mucina & Rutherford (2006)

The following sites within the study area that are found in this vegetation type are (Figure 4.5a):

- Site 4 Verby
- Site 5 Eagle's Crag
- Site 6 Tootabi

4.5.4

Albany Broken Veld

This vegetation type consists of low mountain ridges and hills with an open grassy karroid dwarf shrubland with scattered low trees (*Boscia oleoides, Euclea undulata, Pappea capensis, Schotia afra* var. *afra*) with a matrix of dwarf shrubs (*Becium burchellianum, Chrysocoma ciliata*) and grasses (*Eragrostis obtusa*). Key species within this vegetation type are listed in Table 4.5.4.

According to the STEP programme, there are two municipal level vegetation types within the Kowitz Thicket. These are the Sallaire Karroid Thicket and the Eastern Lower Karoo.

Table 4.5.4

Important flora species of the *Albany Broken Veld* vegetation type

Vegetation Type	<i>Albany Broken Veld</i>
Small Trees:	Acacia natalitia, Euclea undulata, Yappia capensis, Schotia afra var. afra.
Low Shrubs:	Asparagus striatus, Asparagus suaveolens, Becium burchellianum, Chrysocoma ciliata, Selago fruticosa.
Graminoids:	Aristida congesta, Eragrostis obtusa, Sporobolus fimbriatus, Tragus berteronianus.

The following sites within the study area that are found in this vegetation type are (Figure 4.5a and Figure 4.5b):

- Site 7 Blinkhof.
- Site 8 Sallaire
- Site 9 Kommatagga
- Site 10 Golden Valley
- Site 10.3 Golden Valley possible borrow pit

4.5.5

Albany Alluvial Vegetation

Two major types of vegetation pattern are observed in these zones, namely riverine thicket and thornveld (*Acacia natalitia*). The riverine thicket tends to occur in the narrow floodplain zones in regions close to the coast or further inland, whereas the thornveld occurs on the wide floodplains further inland. Key species within this vegetation type are listed in Table 4.5.5.

According to the STEP programme, this is known as the Sundays Doring Veld.

Table 4.5.5 Important flora species of the Albany Alluvial vegetation type

Vegetation Type	Albany Alluvial Vegetation
Riparian thickets	<i>Acacia nautilia</i> , <i>Salix mucronata subsp. mucronata</i> , <i>Scaevola</i>
Small Trees:	<i>afra var. afra</i> .
Riparian Thickets	<i>Pentzia incana</i> .
Low Shrubs:	
Riparian Thickets	<i>Sporobolus nitens</i> .
Graminoids:	
Reed beds	<i>Cyperus papyrus</i> , <i>Phragmites australis</i> .
Megagraminoids:	
Flooded	<i>Cynodon dactylon</i>
grasslands & herblands	
Graminoids:	

The following sites within the study area that are found in this vegetation type are (Figure 4.5a):

- Site 2: Addo.

4.5.6

Great Fish Thicket

Sleep slopes of deeply dissected rivers supporting short, medium and tall thicket types where both the woody trees and shrubs and the succulent component are well developed, with many spinescent shrubs. *Portulacaria afra* is locally dominant, decreasing in relative abundance and is replaced by *Euphorbia bohaie* with increasing aridity.

The closed canopy of the *Portulacaria afra* - dominated thicket is another distinctive feature of parts of the Great Fish Thicket. Key species within this vegetation type are listed in Table 4.5.6.

According to the STEP programme, this is known as the Fish Speekboom Thicket.

Table 4.5.6

Important flora species of the Great Fish Thicket vegetation type

Vegetation Type	Great Fish Thicket
Succulent Tree:	<i>Euphorbia triangulatis</i> .
Small Tree:	<i>Pappia capensis</i> .
Tall Shrub:	<i>Euclea undulata</i> .
Low Shrubs:	<i>Asparagus striatus</i> , <i>Chaetacanthus setiger</i> , <i>Chrysocoma ciliata</i> .
Succulent Shrubs:	<i>Crassula cordata</i> , <i>Crassula ovata</i> , <i>Portulacaria afra</i> .
Graminoids:	<i>Aristida congesta</i> , <i>Cynodon incompletus</i> , <i>Digitaria eriantha</i> , <i>Ehretia erecta</i> , <i>Eragrostis obtusa</i> , <i>Panicum densum</i> , <i>Panicum maximum</i> , <i>Panicum staplanum</i> , <i>Setaria sphaecolata</i> , <i>Sporobolus fimbriatus</i> , <i>Sporobolus nitens</i> , <i>Themeda triandra</i> , <i>Tragus berteromanus</i> , <i>Tragus koelerioides</i> .
Herbs:	<i>Cyanotis speciosa</i> , <i>Hypoestes aristata</i> , <i>Salvia scabra</i> .
Succulent Herbs:	<i>Crassula expansa</i> .
Caespitose Herb:	<i>Sansevieria hyacinthoides</i> .

The following sites within the study area that are found in this vegetation type are (Figure 4.5b):

- Site 10.1 Road borrow pit near Cookhouse
- Site 10.2 Cookhouse possible borrow pit.

4.5.7

Southern Karoo River

This vegetation type contains narrow riverine flats supporting a complex of *Acacia karoo* or *Tamarix usneoides* thickets (up to 5 m tall), and fringed by tall *Salsola* - dominated shrubland (up to 1.5 m high). In sandy drainage lines *Stipagrostis namaquensis* may occasionally also dominate. Key species within this vegetation type are listed in Table 4.5.7.

According to the STEP programme, this is known as the Southern Karoo Alluvia.

Table 4.5.7

Important flora species of the Southern Karoo River vegetation type

Vegetation Type	Southern Karoo River
Riparian Thickets Small Trees:	<i>Acacia karoo</i> , <i>Rhus lancea</i> .
Riparian Thickets Tall Shrubs:	<i>Diospyros lycoides</i> , <i>Tamarix usneoides</i> .
Riparian Thickets Succulent Shrub:	<i>Lycium cinereum</i> .
Rocky slopes of river canals	<i>Stipagrostis namaquensis</i> .
Graminoids:	
Alluvial shrublands & herblands	<i>Malephora uitenhagensis</i> , <i>Salsola aphylla</i> , <i>Salsola arboorea</i> .
Succulent Shrubs:	<i>Cynodon incompletus</i> .
Alluvial shrublands & herblands	
Graminoids:	
Reed beds Megagraminoids:	<i>Phragmites australis</i> .

The following sites within the study area that are found in this vegetation type are (Figure 4.5b):

- Site 11 Klipfontein
- Site 11.1 Cutting as borrow pit

- Site 12 Mortimer.
- Site 14 Marlow New Borrow Pit

4.5.8 Eastern Upper Karoo

This vegetation type consists mainly of gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Haardeveld in the west, besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast). It is dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis*. The grass cover increases along a gradient from southwest to northeast. Key species within this vegetation type are listed in Table 4.5.8.

Table 4.5.8 Important flora species of the Eastern Upper Karoo vegetation type

Vegetation Type	Eastern Upper Karoo
Tall Shrubs:	<i>Lycium cinereum</i> .
Lean Shrubs:	<i>Chrysocoma ciliata</i> , <i>Eriocapulus ericoides subsp. ericoides</i> , <i>Eriocapulus spinescens</i> , <i>Pentzia globosa</i> , <i>Pentzia incana</i> , <i>Phymaspermum parvifolium</i> , <i>Salsola calluna</i> .
Geophytic Herb:	<i>Moraea pallida</i> .
Grimmioids:	<i>Aristida congesta</i> , <i>Aristida diffusa</i> , <i>Cynodon incompletus</i> , <i>Eragrostis bergiana</i> , <i>Eragrostis bicolor</i> , <i>Eragrostis lehmanniana</i> , <i>Eragrostis obtusa</i> , <i>Sporobolus fimbriatus</i> , <i>Stipagrostis ciliata</i> , <i>Tragus koelerioides</i> .

The following sites within the study area that are found in this vegetation type are (Figure 4.5b, Figure 4.5c and Figure 4.5d):

- Site 13 Halesowen
- Site 15 Kaptein
- Site 16 Knutsford
- Site 16.1 Borrow pit
- Site 16.2 Knutsford Borrow material.
- Site 17 Visrivier
- Site 17.1 Visrivier Collett se quarry
- Site 17.2 Visrivier possible borrow pit (existing)
- Site 18 Conway
- Site 18.1 Conway possible borrow pit
- Site 19 Gienheath
- Site 20 Tafelberg
- Site 21 Rosmead
- Site 23 Carlton
- Site 24 Barredeel.
- Site 25 Wildfontein
- Site 25.1 Borrow pit near Wildfontein
- Site 26 Linde
- Site 27 Hanover Road
- Site 27.2 Existing borrow pit

4.5.9 Tarkastad Montane Shrubland

This vegetation type consists mainly of ridges, hills and isolated mountain slopes, characterized by high surface rock cover, this often consisting of large, round boulders. The vegetation is low, semi - open mixed shrubland with 'white' grasses and dwarf shrubs forming a prominent component of the vegetation (Mucina & Rutherford 2006). Key species within this vegetation type are listed in Table 4.5.9.

According to the STEP programme, this is known as the Drakensberg Montane Shrubland.

Table 4.5.9 Important flora species of the Tarkastad Montane Shrubland vegetation type

Vegetation Type	Tarkastad Montane Shrubland
Succulent Tree:	<i>Aloe ferax</i> .
Tall Shrubs:	<i>Diospyros austro - africana</i> .
Lean Shrubs:	<i>Euryops amae</i> .
Grimmioids:	<i>Aristida adscensionis</i> , <i>Aristida congesta</i> , <i>Aristida diffusa</i> , <i>Cynodon incompletus</i> , <i>Enneapogon scoparius</i> , <i>Eragrostis chloromelas</i> , <i>Eragrostis lehmanniana</i> , <i>Eragrostis obtusa</i> , <i>Heteropogon contortus</i> , <i>Tragus berteronianus</i> , <i>Tragus koelerioides</i> .

The following sites within the study area that are found in this vegetation type are (Figure 4.5b and Figure 4.5c):

- Site 14 Marlow
- Site 16.1 Borrow Pit
- Site 22 Flonker

4.5.10 Northern Upper Karoo

This vegetation type consists of shrubland dominated by dwarf karoo shrubs, grasses, and *Acarica mellifera* subsp. *deflexa*. It is flat to gently sloping, with isolated hills of Upper Karoo Haardeveld in the south and Vaalbos Rocky Shrubland in the northeast. Furthermore it is interspersed with a number of pans. Key species within this vegetation type are listed in Table 4.5.10.

Table 4.5.10 Important flora species of the Northern Upper Karoo vegetation type

Vegetation Type	Northern Upper Karoo
Tall Shrubs:	<i>Lycium cinereum</i> .
Lean Shrubs:	<i>Chrysocoma ciliata</i> , <i>Gnidia polycephala</i> , <i>Pentzia calcarata</i> , <i>Pentzia globosa</i> , <i>Pentzia incana</i> , <i>Pentzia spinescens</i> , <i>Rosenia humilis</i> .
Semi-parasitic Shrubs:	<i>Thesium hystrix</i> .
Grimmioids:	<i>Aristida adscensionis</i> , <i>Aristida congesta</i> , <i>Aristida diffusa</i> , <i>Enneapogon desvauxii</i> , <i>Eragrostis lehmanniana</i> , <i>Eragrostis obtusa</i> , <i>Eragrostis truncata</i> , <i>Sporobolus fimbriatus</i> , <i>Stipagrostis obtusa</i> .

The following sites within the study area that are found in this vegetation type are (Figure 4.5d):

- Site 28 Burgervilleweg
- Site 29 Bletterman
- Site 29.1 Road borrow pit.

4.5.11

Kimberley Thornveld

This vegetation type consists of often slightly irregular plains with a well-developed tree layer consisting of *Acacia erioloba*, *Acacia tortilis*, *Acacia karroo*, and *Boscia albitrunca*. It also has a well-developed shrub layer with occasional dense stands of *Tarchonanthus capensis* and *Acacia mellifera*. Key species within this vegetation type are listed in Table 4.5.1.

Table 4.5.1

Important flora species of the Kimberley Thornveld vegetation type

Vegetation Type	Kimberley Thornveld
Tall Tree:	<i>Acacia erioloba</i> .
Small Trees:	<i>Acacia karroo</i> , <i>Acacia mellifera</i> sbsp. <i>detinens</i> , <i>Acacia tortilis</i> sbsp. <i>heteracantha</i> .
Tall Shrubs:	<i>Tarchonanthus capensis</i> .
Low Shrubs:	<i>Acacia hebeclada</i> sbsp. <i>hebeclada</i> .
Graminoids:	<i>Eragrostis lehmanniana</i> .

The following sites within the study area that are found in this vegetation type are (Figure 4.5e):

- Site 33 Ronaldsvlei & Beaconfield

4.5.12

Kuruman Thornveld

This vegetation type is flat rocky plains with some sloping hills with a very well-developed, closed shrub layer and well-developed open tree stratum consisting of *Acacia erioloba*. Key species within this vegetation type are listed in Table 4.5.2.

Table 4.5.2

Important flora species of the Kuruman Thornveld vegetation type

Vegetation Type	Kuruman Thornveld
Tall Tree:	<i>Acacia erioloba</i> .
Small Trees:	<i>Acacia mellifera</i> sbsp. <i>detinens</i> , <i>Boscia albitrunca</i> .
Tall Shrubs:	<i>Grewia flava</i> , <i>Lycium hirsutum</i> , <i>Tarchonanthus capensis</i> .
Low Shrubs:	<i>Acacia hebeclada</i> sbsp. <i>hebeclada</i> , <i>Monoclema divaricatum</i> .
Graminoids:	<i>Aristida meridionalis</i> , <i>Aristida stipitata</i> sbsp. <i>stipitata</i> , <i>Eragrostis lehmanniana</i> .

The following sites within the study area that are found in this vegetation type are (Error! Reference source not found.5f):

- Site 32 Postmansburg yard (including PWC Electrifying line)

4.5.13

Kathu Bushveld

According to Mucuna & Rutherford (2006), this vegetation type consists of a medium-tall tree layer with *Acacia erioloba* in places but mostly open and

Table 4.5.3

Important flora species of the Kathu Bushveld vegetation type

Vegetation Type	Kathu Thornveld
Tall Tree:	<i>Acacia erioloba</i> .
Small Trees:	<i>Acacia mellifera</i> sbsp. <i>detinens</i> , <i>Boscia albitrunca</i> .
Tall Shrubs:	<i>Diospyros lycoides</i> sbsp. <i>lycoides</i>
Graminoids:	<i>Aristida meridionalis</i> , <i>Bracharia nigropetala</i> , <i>Centropodia glauca</i> , <i>Eragrostis lehmanniana</i> , <i>Schmidtia pappophoroides</i> , <i>Stipagrostis ciliata</i> .

The following sites within the study area that are found in this vegetation type are (Error! Reference source not found.5f):

- Site 30 Hotazel
- Site 30.2 HZL The in of triangle.
- Site 31 Mamathwane yard
- Site 31.3 Middelplaas lake off
- Site 34 Emil Substation

including *Boscia albitrunca* as the prominent trees. The shrub layer consists of species such as *Acacia mellifera*, *Diospyros lycoides* and *Lycium hirsutum*.

Key species within this vegetation type are listed in Table 4.5.3.