The assessment of impacts will largely be based on the Department of Environmental Affairs and Tourism's (1998) Guideline Document: Environmental Impact Assessment Regulations. The assessment will consider impacts arising from the proposed decommissioning activities of the project both before and after the implementation of appropriate mitigation measures.

The impacts will be assessed according to the criteria outlined in this section. Each issue is ranked according to extent, duration, magnitude (intensity) and probability. From these criteria, a significance rating is obtained, the method and formula is described below. Where possible, mitigation recommendations have been made and are presented in tabular form.

The criteria given in the tables below will be used to conduct the evaluation. The nature of each impact was to be assessed and described in relation to the extent, duration, intensity, significance and probability of occurrence attached to it.

Table 1: Methodology Used in determining the significance of potential environmental impacts

Status of Impact
The impacts are assessed as either having a:
negative effect (i.e. at a `cost' to the environment),
positive effect (i.e. a `benefit' to the environment), or
Neutral effect on the environment.

Extent of the Impact
(**1**) Site (site only),
(**2**) Local (site boundary and immediate surrounds),
(**3**) Regional (within the City of Johannesburg),
(**4**) National, or
(**5**) International.

Duration of the Impact
The length that the impact will last for is described as either:
(**1**) immediate (<1 year)
(**2**) short term (1-5 years),
(**3**) medium term (5-15 years),
(**4**) long term (ceases after the operational life span of the project),
(**5**) Permanent.

Magnitude of the Impact
The intensity or severity of the impacts is indicated as either:
(**0**) none,
(**2**) Minor,
(**4**) Low,
(**6**) Moderate (environmental functions altered but continue),
(**8**) High (environmental functions temporarily cease), or
(**10**) Very high / Unsure (environmental functions permanently cease).

Probability of Occurrence
The likelihood of the impact actually occurring is indicated as either:
(**0**) None (the impact will not occur),
(**1**) improbable (probability very low due to design or experience)

(**2**) low probability (unlikely to occur),
(**3**) medium probability (distinct probability that the impact will occur),
(**4**) high probability (most likely to occur), or
(5) Definite.

Significance of the Impact

Based on the information contained in the points above, the potential impacts are assigned a significance rating (**S**). This rating is formulated by adding the sum of the numbers assigned to extent (**E**), duration (**D**) and magnitude (**M**) and multiplying this sum by the probability (**P**) of the impact.
S=(E+D+M)P

The significance ratings are given below

(**<30**) low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
(**30-60**) medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
(**>60**) high (i.e. where the impact must have an influence on the decision process to develop in the area).

The impacts of the proposed project are assessed and rated as follows:

IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

Impacts Resulting from the Planning and Design Phase

Direct Impacts:

Employment Creation

The planning and design of the proposed development requires input from various individuals, resulting in the employment opportunities for such persons. This employment would include both direct (e.g. Environmental Consultants, Engineers, Project Managers, Planners, etc.) and indirect (e.g. reviewing and commenting authorities such as the local authority planning authorities and the environmental authorities). The extent and magnitude of this impact is relatively low compared to the other economic impacts, and is typically restricted to a limited number of professionals. The identified technical alternatives are likely to result in the same level of significance for this impact. The No-go Alternative would differ in that this impact would not occur.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Employment Creation	No	Positive	3	2	8	4	52 Medium
	Yes	N/A	N/A	N/A	N./A	N/A	
Corrective Actions	• No mitigation measures have been identified.						

Indirect Impacts:

None Identified.

Cumulative Impacts:

No cumulative impacts were identified.

Alternative 1

Impacts Resulting from the Construction Phase

Direct Impacts:

Soil erosion and Storm water Management

The loss of topsoil in South Africa is a national concern and thus erosion control should be taken seriously. Ineffective storm water management systems can result to soil erosion. Where soils are highly erodible, adequate measures must be implemented to prevent undue soil erosion.

Extensive soil erosion is not expected during the construction phase, however, it is anticipated that occurrence of such might occur during wet seasons especially on the stockpiles (Topsoil and Subsoil).

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Soils erosion and storm water management	No	Negative	2	2	4	4	32 Medium
	Yes	Negative	1	1	2	3	12 Low
Corrective Actions	• Soil must be stabilised in order to prevent the resulting wash downs into any water resource and where possible rehabilitation of the disturbed area must be done concurrently with the construction activity. • A storm water management plan must be implemented to prevent pollution runoff. • Stockpiles should be piled up to 2m or less. • Foundation excavations for each structure must be inspected by a competent person during construction. • Construction must be preferably during the dry season. • In the event of significant erosion occurring, adequate corrective measures must be implemented to prevent any further soil loss.						

	• Proper storm water management measures must be put in place.

Impact on Agriculture

The proposed substation is located within a high agricultural potential area, however, the immediate footprint is not in use. It is anticipated that given the relatively small scale of the proposed project the impact on agricultural production will not be significant. The potential impact is considered to be medium in significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Agriculture	No	Negative	3	3	6	4	48 Medium
	Yes	Negative	2	2	4	2	16 Low
Corrective Actions	• Agricultural land must not be disturbed unnecessarily. • The Contractor must take cogniscence of agricultural activities taking place. • Access to farms must be restricted. • Contractors must not damage the surrounding fences.						

Impact on Traffic

During construction, increase in traffic is likely to result from delivery of construction materials to and from the construction works. The impact of increased traffic can be considered local in extent, short term in duration with the overall impact been negative with medium significance. However with implementation of proper mitigation measures, it can be reduced to low significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Traffic	No	Negative	3	3	6	4	46 Medium
	Yes	Negative	2	2	4	3	24 Low
Corrective Actions	• The delivery of construction material and equipment should be limited to hours outside peak traffic times (including weekends). • Delivery vehicles must comply with all traffic laws and bylaws. • A speed limit of 30km per hour must be maintained.						

Air pollution

Construction activities on site will lead to land clearing and disturbance of the soil resulting in dust generation. During construction, movement of construction vehicles will present temporary sources of inhalable particulates and dust deposition. Given the nature and magnitude of the proposed project as well as the surrounding mining activities, it is anticipated that very little dust will be generated from the construction activities. The potential impact on air quality will be short term and can be controlled. Proper implementation of recommended corrective measures will reduce the impact to lower significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Air pollution	No	Negative	2	1	4	4	28 = Low
	Yes	Negative	2	1	3	3	18 = Low
Corrective Actions	• Unnecessary clearing of vegetation must be avoided. • All exposed surfaces subjected to dust generation must be managed with appropriate dust suppression methods including amongst others, the use of water tankers etc. • Vehicles travelling on the site should always be within the speed limit. • Exposed surfaces should be rehabilitated after the construction period. • The amount of exposed soil at a particular time must be limited.						

Surface and groundwater pollution

During construction there is potential for construction material to pollute the surface and/or ground water on site. The closest is water resources are a non-perennial river240m west, water canal 30m north and wetland type of habitat 80m south east of the proposed site. Substances such as cement residue, bio fuels, and paints must be adequately controlled. Further, exposed surfaces during construction would provide a source of sediments to be taken up by storm water and resulting in down-stream sedimentation of water resources. This impact is negative and of Medium significance but can be reduced to low with corrective measures.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Surface and ground	No	Negative	3	2	6	4	44 = Medium

water pollution	Yes	Negative	2	2	4	2	16 = Low
Corrective Actions	• No activities should occur within a 100m or within a 1:100 year flood line whichever is greatest without approval from DWS. • Care must be taken during construction to prevent leaks and spillage of materials that may detrimentally affect water quality (especially fuels and chemicals). • Care must be taken to avoid destruction of water courses. • Adequate measures must be taken during construction to manage storm water runoff. • Fuel must be stored in bunded and caged area in limited quantities.. • .During refuelling, drip trays must be placed under the machinery or vehicle to prevent contamination of soil in case of spillages. • In the event of a spillage of a hazardous substance emergency response procedures must be implemented. • Destruction of watercourses must be avoided.						

Waste generation

During the construction phase there will be a variety of waste material produced. The building contractors must adhere to all proposed measures and provide adequate waste skips and bins around the site. Waste must be regularly removed from site and disposed of at appropriate waste disposal sites. The impact may be negative, site specific, low in significance and will last the duration of the construction and rehabilitation phases.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Waste generation and management	No	Negative	2	2	6	5	50 = Medium
	Yes	Negative	1	2	4	3	21 = Low
Corrective Actions	• No waste will be buried on site or incorporated into the foundation trenches. • The work force must be encouraged to sort waste into recyclable and non-recyclable waste. • No burning of waste will be allowed on site. • Waste must be regularly removed from site and disposed of at a registered waste disposal facility.						

Flora and Fauna

The proposed site falls within the least concern Terrestrial Biodiversity Area. However, a highly significant area is

located 1.7km north of the site. Further, the site is located within a Threatened Ecosystem: Vulnerable (Eastern Highveld Grassland) and a category 5 Aquatic Biodiversity Sub catchment. No species of conservation concern were observed in the development footprint and its immediate vicinity. Consequently, it is highly unlikely that any fauna would be significantly impacted by the development.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impact on fauna and flora.	No	Negative	1	2	6	4	36 = Medium
	Yes	Negative	1	2	4	2	14 = Low
Corrective Actions	• The proposed development area should be demarcated and cordoned off. • Should any protected or listed plant species be discovered on the working area, and this cannot be avoided, they must be trans-located to safe sites nearby. • Existing tracks should be used for access wherever possible. • The vegetation clearance within the proposed development footprint must be kept to a minimum. • Excavation must be barricaded and clearly marked to ensure maximum safety. • The proposed development area should be demarcated and cordoned–off using effective measures.						

Noise pollution

At present the land-use in the area is agricultural and mining (slimes dams). The ambient source of noise in the area is presently generated by traffic along the access roads. There will be an increase in noise levels during the construction period emanating from construction vehicles, machinery and workers, which can be a nuisance during construction. The level of noise and extent will depend entirely on the prevailing construction activities within the site. The impact of noise will also be reduced to almost insignificant levels given the small scale of the development, the proposed locality which is far removed from other land owners as well as the short span of the construction period.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Noise pollution	No	Negative	2	2	4	3	24 = Low
	Yes	Negative	1	2	2	2	10 = Low
Corrective	• All vehicles used during construction must be appropriately maintained. • Working hours must be restricted to daytime only (7am – 5pm). • Noise levels should conform to the bylaws.						

Actions	

Fire hazards

Onsite storage of fuel and other flammable solvents, during construction increase the risk of fire. It is anticipated that uncontrolled fires on site could cause damage to infrastructure and the biophysical environment and impact on the social environment. This impact is considered to be of medium significance. Should the recommended mitigation measures be implemented, the significance of the impact will remain negative but low in significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fire hazards	No	Negative	2	2	6	3	30 = Medium
	Yes	Negative	1	1	4	2	12 = Low
Corrective Actions	• Areas were flammable substances are kept must have proper warning signs on display (highly flammable, No smoking etc.) to warn personnel on site of risk associated with such areas. • No burning of waste or cooking will be allowed on site. • Contracting personnel must be well versed in the relevant existing fire and safety management procedures and activities on site. • Implement fire hazard sensitive on- and offloading procedures. • Designate a site safety official and ensure that personnel are adequately trained regarding fire hazards and procedures.						

Impact on cultural and heritage resources

No obvious cultural and historic heritage resources were recorded on the site. The potential impact of the proposed project on cultural heritage sites is considered to have low significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Cultural and heritage resources	No	Negative	2	1	2	2	10 = Low
	Yes	Negative	1	1	0	1	2 = Low
Corrective	• Should heritage or archaeological artefacts be discovered during construction or operational						

Actions	phase, all works must be stopped at the affected area and SAHRA must be contacted.

Impact on Wetlands

A development has several impacts on the surrounding environment and particularly on a wetland. The development changes habitats, the ecological environment, infiltration rates, amount of runoff and runoff intensity of storm water run-off, and therefore the hydrological regime of the site. Since the two site alternatives are so close together, the potential impacts expected on the preferred site will be the same as on the alternative site. **The identified impacts of high significance include the following:**

- Changing the quantity and fluctuation properties of the watercourse; and
- Changing the physical structure within a water resource (habitat).

These impacts can be reduced to medium/low with proper mitigation in place.

The identified impacts of medium significance include the following:

- Alteration of water quality – increasing the amounts of nutrients (phosphate, nitrite, nitrate) or toxic contaminant and hydrocarbons
- Changing the amount of sediment entering water resource and associated change in turbidity (increasing or decreasing the amount)

These impacts can be reduced to low with proper mitigation in place.

Mitigation measures have been included. Refer to Appendix D _Wetland Delineation Report Section 3.4 Pgs. 33-39 for Detailed assessment and mitigation measures.

Indirect Impacts: **None**

Cumulative Impacts: None

Socio-Economic Impact

This phase will result in a positive socio-economic impact as the demand for equipment, building material and labour will increase. Secondary service provision such as food supply, toilet hire, equipment maintenance etc. would also stimulate the local economy during the construction phase. This is a positive impact of a short duration.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Socioeconomic	No	Positive	3	2	8	5	65 = High
	Yes	N/A	N/A	N/A	N/A	N/A	
Corrective Actions	• Contractors should by all means practise the localisation matrix while seeking for construction equipment or building materials. • For minimal jobs, the appointed contractor should by all means consider the local residents for jobs that do not need any skill transfer.						

Alternative 2

Environmental Impacts for this alternative during the construction phase will be similar to the impacts of the preferred alternatives.

No go Alternative

Direct Impacts: Should the proposed development not continue, none of the identified impacts would result.
Indirect Impacts:
Cumulative Impacts: None identified

IMPACTS ASSOCIATED WITH THE OPERATIONAL PHASE

Alternative 1

Impacts Associated with the Operational Phase

Direct Impacts:

Socioeconomic

In the short and longer term, the proposed substation supports the operation of railway infrastructure and will ensure reliable power supply to meet future demands and Transnet's supply need. The operational phase of the proposed project will have significant long term positive socioeconomic impacts.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Socioeconomic	No	Positive	3		8	5	75 = High
Corrective Actions	• Regular maintenance of the facility should be done continuously to ensure uninterrupted supply of energy.						

Employment creation

The employment opportunities during the operational phase will arise as a result of the actual maintenance work required to keep the facility running. The significance of this impact is anticipated to be positive and medium in significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
employment	No	Positive	3	4	6	4	52= Medium

creation	N/A						
Corrective Actions	• No mitigation						

Indirect Impacts: None identified.

Cumulative Impacts: None identified.

Alternative 2:

Impacts Associated with the Operational Phase

Soil, Surface and Ground Water

The proposed diesel technology will have relatively higher impacts on soil, ground and surface water due to the large quantity of diesel that will be stored on site. The potential impact is highly probable, with long term impacts of high significance. With proper mitigation, the impact can be reduced to medium.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Soil, Surface and Ground water	No	Negative	3	4	8	4	60= High
	Yes	Negative	2	4	6	3	36 = Medium
Corrective Actions	• All national, regional and local legislations with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials must be adhered to. • Training and education of all personnel on site who will be handling the material about its proper use, handling and disposal must be undertaken. • An emergency procedure for the management of spills or toxic substances must be established. • Storage of all hazardous material is to be safe, tamper proof and under strict control. • Petroleum, chemical, harmful and hazardous waste throughout the site must be stored in appropriate, well maintained containers. • Exercise extreme care with the handling of diesel and other toxic solvents to ensure that spillage is minimised. • Any accidental chemical / fuel spills have to be corrected immediately.						

Socioeconomic

Alternative 2 will yield similar output as Alternative 1; however, at a relatively higher cost. This will be long term and will have a significant bearing on Transnet's operational cost, which can be considered negative and of high significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Socioeconomic	No	Negative	3	4	6	5	65= High
Corrective Actions	• None						

Fire

The proposed diesel alternative is more susceptible to fire. The potential impact is highly probable, negative with medium significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fire	No	Negative	2	4	8	4	56= Medium
	Yes	Negative	1		6	3	36 = Medium
Corrective Actions	• Fuels or chemicals must be stored at the designated storage area. • Gas and liquid fuels may not be stored in the same storage area. • Adequate fire-fighting equipment at the fuel stores must be provided all the time. • No open fires for heating or cooking will be permitted on site. • The site must be protected against fire, and a sufficient fire break must be constructed.						

No-go alternative

Direct Impacts: None of the impacts identified for the proposed activity will occur (including positive and negative impacts) if the proposed activity does not proceed.

Indirect Impacts: None identified

Cumulative Impacts: None identified

IMPACTS ASSOCIATED WITH THE DECOMMISSIONING PHASE

At present it is not anticipated that the proposed infrastructure will ever be decommissioned. On-going maintenance and upgrades, where necessary will be carried out. In the unlikely event that decommissioning is necessary it is recommended that the potential impacts identified below are reviewed and a detailed decommissioning strategy and rehabilitation plan is prepared and implemented. **Impacts for decommissioning phase are similar for both alternatives.**

Impacts Associated with the Decommissioning Phase

Direct Impacts

Waste

The decommissioning of the proposed project will contribute to large amounts of waste material that will be produced. The decommissioning will contribute to a large portion of bare soil being exposed to erosion if not rehabilitated properly. This waste material should be disposed of in an appropriate manner.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Waste	No	Negative	3	2	8	4	52 = Medium
	Yes	Negative	3	1	6	3	30 = Low
Corrective Actions	• Disposal of waste at a registered waste disposal site. • Non-hazardous material should be recycled and utilised in other construction processes. • An appropriate rehabilitation plan should be in place.						

Dust generation

Decommissioning of the facility and other infrastructure may lead to an increased amount of airborne particles in the local atmosphere as the infrastructure is dismantled and transported to the disposal site. The significance of this impact will be of low negative significance.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Dust Generation	No	Negative	3	1	6	5	50 = Medium
	Yes	Negative	2	1	4	3	21 = Low
Corrective Actions	Use of dust suppression techniques to reduce the dust.						

Indirect Impacts: None Identified.

Cumulative Impacts: None identified.

No-go alternative

Direct Impacts: None of the impacts identified for the proposed activity will occur. If the proposed infrastructure is not to be decommissioned, it will require continuous maintenance and the measures identified for the operational phase must be continued. Efforts for continual improvement must be encouraged.

Indirect Impacts: None identified

Cumulative Impacts: None identified