4 PROJECT DESCRIPTION

The proposed project is for the construction and operation of a railway line and associated infrastructure from the existing Pretoria-Witbank railway line to Kusile Power Station. The railway as well as its infrastructure are briefly described below. It is important to note that a corridor of 500 metres was assessed for each railway line alternative and that a servitude of approximately 35 metres in width is required for the actual railway line and access road. Additionally a corridor of 75 metres was assessed for each 88kV / 132kV power line alternative while a servitude width of 36 metres is required for the actual power line.

4.1 Proposed Railway Line

The following components of the railway design were taken into consideration:

- Length of the railway;
- Railway layout for the unloading facility;
- Frequency of trains;
- Formation design;
- Track design;
- Signalling design;
- Electrical design; and
- Communication design.

4.1.1 Corridor Length

The length of the proposed railway line will range between 10 and 20 km depending on the alternative recommended out of the three alternatives.

4.1.2 Rail Layout for Unloading Facility

The sorbent rail yard will be designed for 50 wagon trains hauled by six locomotives. The layout will include unloading options by means of a bottom discharge wagon (Figure 4-1) or tippler (Figure 4-2). The offloading yard will be located next to the power station for the shortest practical conveyor route to the sorbent stockpile. Two loops will be provided on each side of the unloading point to allow a set of 50 loaded wagons to be placed and a set of 50 empty wagons unloaded in a previous operation to be removed. The sorbent yard length is approximately three kilometres in length..

FIGURE 4-1: EXAMPLE OF A BOTTOM DISCHARGE WAGON.

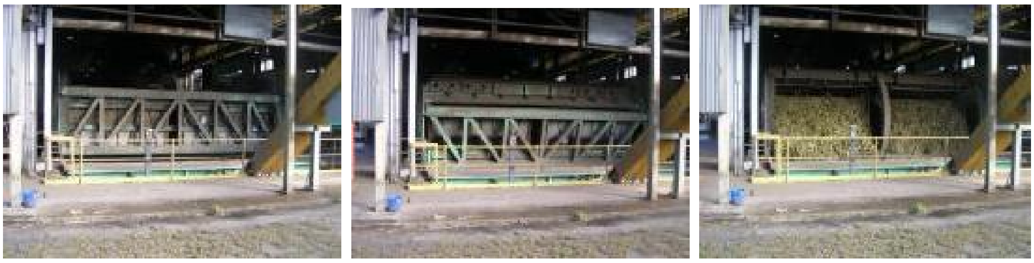

FIGURE 4-2: EXAMPLE OF A TIPPLER WAGON.

4.1.3 Frequency of Trains

It is envisioned that one train will enter the siding and one train will exit the siding on a daily basis (total of two trains per day). The exact times of travelling of the wagons will be informed by consultations and engagements with Transnet Freight Rail (TFR), who will be operating the rail.

4.1.4 Formation Design

The formation design approach for this project will be based on the following engineering principles:

- To optimise the use of in-situ materials;
- To ensure proper horizontal and vertical alignment;
- To ensure drainage designs conforming to the required standards with special attention given to cross drainage;
- To provide an appropriate formation structure for a 25-year design life; and
- To ensure that the proposed design of the formation is economical and cost effective in terms of construction and subsequent maintenance.

4.1.5 Track Design

The track design will allow for an axle load of 20 ton and it will be to class N2 standard. The minimum radius of curves on the line will be 500 m. This is to ensure that the new proposed railway line's track design is in accordance with the existing track design of the Transnet Freight Rail (TFR) line from which it takes off.

FIGURE 4-3: EXAMPLE OF THE TRACK DESIGN.

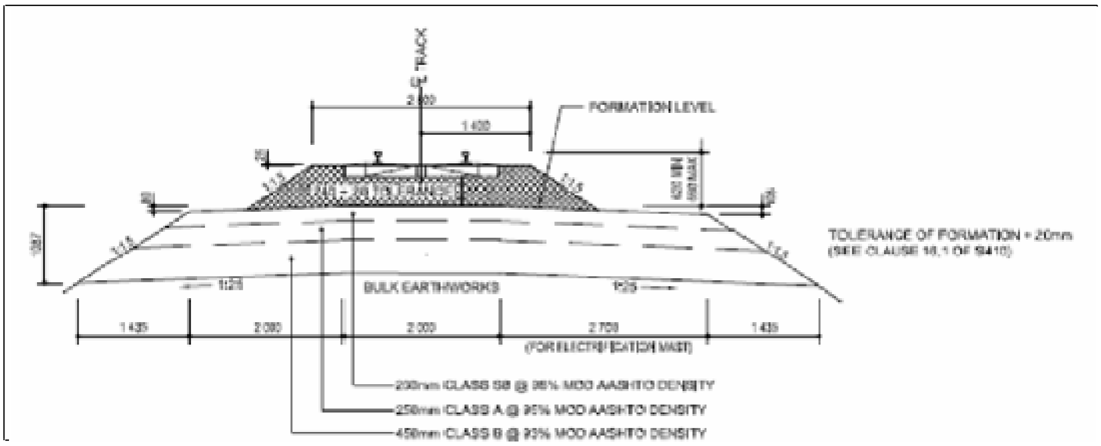

FIGURE 4-4: TYPICAL CROSS SECTION OF FORMATION AND TRACK DESIGN.

4.1.6 Signalling Design

The signalling design will be done to interface with the existing TFR signalling system and enable TFR to operate it as a part of the centralised train control system. The rail connection will require an additional relay room (Figure 4-5 and Figure 4-6) and the associated changes to the existing control panels.

FIGURE 4-5: EXAMPLE OF THE PROPOSED RELAY ROOM.

FIGURE 4-6: EXAMPLE OF THE CONTENTS OF A RELAY ROOM.

4.1.7 Electrical Designs

The electrical substation and overhead traction design will be done to the latest prevailing standards. It will make use of auto-tensioning devices on the overhead traction equipment (OHTE) and will be able to cater for 50 wagon trains with an axle load of 20 ton (Figure 4-7).

The OHTE system voltage will be 3.3 kV DC. The OHTE system will be fed by one or two 4.5 MVA or 6 MVA substations (Figure 4-8). The substations will be constructed next to the rail line. Eskom power lines will be required to link these substations with the existing Eskom transmission network. The positions of these lines are dependent on the position of the traction substations.

Two substations are required and are proposed to be located adjacent to the approved railway line. The location of the substations was based on an area with the least environmental impacts and near to the proposed Eskom distribution line (88kV / 132kV) from which it can be fed.

FIGURE 4-7: EXAMPLE OF THE PROPOSED OHTE.

4.1.8 Communications Design

The communication design will be done to interface with the communication system of TFR in order to operate the line as part of their network. The communication will allow for remote control of signalling equipment.

The existing TFR railway between Greenview and Witbank Stations has a limitation of 50 wagon trains. The approach is to design the connection to the northern TFR rail line in such a way to allow the eastern and western approaching trains on the TFR rail line to enter the siding without delay. This can be done if the signalling of the siding is integrated and controlled by TFR.

The communication system will not be visible and have “minimal” to “no impact”. The only visible item will be the optic fibre cable approximately 8 mm in diameter along the OHTE.

4.1.9 Geometric Design Standards

The line will be designed for 20 ton per axle loads at a maximum gradient of 1% (1:100) and in accordance with the following design documents:

- SANS 3000-1 Standards (Appendix J); and
- Standard Guidelines for the construction of rail lines.

The design criteria are outline in Table 4-1 below.

TABLE 4-1: DESIGN CRITERIA FOR THE ALIGNMENT AND SORBENT YARD (UNLOADING).

PARAMETER	DESIRABLE
ALIGNMENT	
Design speed	70 km/h
Minimum radius	500 m
Design speed for super elevation	70 km/h
Minimum gradient	1.0%
Minimum rail reserve width (including service road)	±31 m depending on cut and fill heights
SORBENT YARD	
Design speed	30 km/h
Minimum radius	400 m
Design gradient	1:800 min
Minimum rail reserve width	22.3 m

4.2 Proposed Associated Infrastructure

The following associated infrastructure is envisioned for the proposed railway.

4.2.1 Substation

As mentioned in Section 4.1 it is proposed to construct two substations adjacent to the railway track, within the studied railway corridor. The footprint of the substation will be approximately 65 metres by 30 metres (Figure 4-8). For further information on the alternative locations for the substation please refer to Section 5.3.

FIGURE 4-8: EXAMPLE OF THE PROPOSED SUBSTATION TO BE CONSTRUCTED FOR THE RAILWAY LINE.

4.2.2 Rail Yard and Unloading Facility

The railway yard and unloading facility will be located in the footprint of the Kusile Power Station land on Eskom property.

4.2.3 88 / 132 kV Power Lines

In order for the railway to be electrified an 88 / 132kV power line is required to provide electricity. An example of such a low voltage power line is provided below (Figure 4-9). This 88 / 132kVkV line will feed off of an existing 88kV line which runs from Groopan Substation to Witbank. Since the 88 / 132kV line will be used to provide electricity to the proposed substations the lines will run from the existing 88kV to each proposed substation. The servitude required for an 88/132kV power line must have a minimum width of 36 metres. Please refer to Section 5.3 for further information on the 88/132kV power line alternatives.

FIGURE 4-9: EXAMPLE OF A LOW VOLTAGE DISTRIBUTION POWER LINE.

4.2.4 Access Roads and Fencing

The proposed maintenance / access road will be within the approved railway corridor (approximately 31 metres in width) (Figure 4-10). The access road will run parallel to the railway line, as far as possible. It is envisioned that the access road and railway servitude will be fenced off for safety and security reasons, with appropriate fencing.

FIGURE 4-10: EXAMPLE OF AN ACCESS ROAD.

4.2.5 Masts

Mast(s) may be required in order for the train to receive signalling directions, and to allow other necessary communication. These masts may be used as necessary for appropriate purposes in the development.

4.2.6 Bridges

Where the railway crosses a stream or road the following structures may be required to be constructed:

- Culverts: Crossing streams or providing for storm water runoff ;
- Road over rail bridges: Crossing under roads;
- Rail over road bridges: Crossing over roads;
- Rail over stream bridges: Crossing streams.

Cattle crossings under / over rail structures may also be constructed, if deemed necessary, allowing for livestock to cross the rail track safely.

Additionally the proposed railway line will cross a water pipeline at Chainage 11.8850 in the power block (within Eskoms' property) (Figure 8-2). The pipeline has a concrete encasement approximately three metres deep. The rail will traverse above the pipeline.

4.3 Major Activities of the Overall Project (including the EIA)

The major activities for the proposed project (including the EIA), prior to and after construction, are explained in the table below.

TABLE 4-2: MAJOR ACTIVITIES FOR THE PROPOSED PROJECT.

NO	ACTIVITY	DETAILS
		PRECONSTRUCTION PHASE
1	Screening	Prior to the undertaking of an EIA a technical team devised six railway corridor alternatives for the proposed project. An environmental team was commissioned to undertake a screening exercise in the area to determine the top three most feasible alternatives from an environmental perspective to take into the EIA.
2	EIA	An EIA is being undertaken to ensure that all environmental, social and cultural impacts are identified and to ensure that stakeholders have the opportunity to raise issues and concerns. This is necessary to obtain Environmental Authorisation from the competent authority in this case the Department of Environmental Affairs (DEA);
3	Consultation with private property owners and registration of servitudes	All stakeholders and property owners will be engaged in the EIA however Eskom will have to begin with land negotiations in order to purchase servitudes.
4	Structure foundation investigation	Investigations will be undertaken to ensure that the foundation specifications are in line with the underlying geology.
5	Approval from road, rail and water authorities	
6	Relocation of services	If any infrastructure needs to be relocated for the development it must be undertaken prior to commencement with construction.
		CONSTRUCTION PHASE
1	Structures	**Fencing** - Provide a safe and secured rail transport area to restrict access and prevent injuries to livestock.
		Formation - Provide a ground formation compacted to the correct standard and alignment on which to build the railway track. The formation can be in a cutting or in the form of an embankment. The slope on either side of the formation will suit soil conditions, usually in the order of 1:1.5. Slopes determine the width of the formation and thus the width of the servitude. The servitude will be fenced in and may be up to 40 m wide in extreme cases but 20m wide normally.
		Drainage - Provide water drainage channels along and accross the track and within the servitude to provide for the maintenance of the line and its components (Please refer to the EMP for the maintenance of the drainage channels).
		Bridge Structures - Provide structures at road or stream crossings, or for moving livestock, that may be classified as: • Culverts: Crossing streams and or providing for storm water runoff; • Road over rail bridges: Crossing under roads; • Rail over road bridges: Crossing over roads; or • Rail over stream bridges: Crossing streams. Cattle crossings under / over rail structures: Allowing for livestock to cross the rail track safely.
		Perway - Provide the railway track (permanent way) consisting of: • Ballast: Stone acting as a flexible support under the sleepers (comprised mainly of granite); • Sleepers: Supporting the rails; and • Rails: The rails carrying a train (will be 48 kg/m rails or heavier) Turnouts: Installations in a track that guide a train from one line to another.
2	Construct Overhead Traction Equipment	The OHTE will be constructed to provide electricity to the locomotives via the pantographs mounted on top of the locomotives. The OHTE provides a transmission line along the corridor transferring continuous power through the contact wire to the pantographs of a train passing underneath the OHTE.
3	Design and Construct 3kV DC traction substations	Two substations are required along the rail corridor to transform 3 phase 88 kV or 132 kV electricity from Eskom to 3kV DC feeding the OHTE. The substations, normally spaced 10 km apart, are placed on a suitable site next to the track. The typical size of such a substation site is 65m x 30m.
4	Construct bulk power supply transmission or distribution lines to traction substations (Eskom)	These transmission / distribution lines are required to feed the traction substations from the Eskom supply. They can typically be 88 kV or 132 kV, three phase which are standard Eskom voltages.
5	Design and construct signalling and rail bound	A signalling system is required to control trains in order to maintain safe following distances and to avoid head-on collisions. The signal system is specifically required at the take off point of the line

	communication system	where it connects with Transnet Freight Rail system near Wilge River station. Signals in the form of colour lights mounted on poles will be provided next to the track where required.
REHABILITATION PHASE		
1	Rehabilitate the construction area	The area where construction has taken place must be rehabilitated to minimise environmental degradation by following the Environmental Management Plan that is compiled in conjunction to the EIA.
OPERATIONAL PHASE		
1	Commencement of operations	Rehabilitation tasks may take place either after or progressively during construction once the tasks have been completed the transportation of sorbent to the power station may commence.
DECOMMISSIONING AND CLOSURE PHASE		
1	Decommissioning of the railway and its infrastructure	Once the railway line is no longer in use and is no longer required a decommissioning process may commence.

4.4 Overall Project Schedule (up to construction)

The primary milestones for the Kusile rail line project (prior and through to post construction) are described in Table 4-3 below.

Table 4-3: Primary milestones of the Kusile Rail Line.

MILESTONES	DATE
Final Scoping Report	September 2009
Undertake Specialist Studies	September / October 2009
Draft EIR and EMP	October 2009
Stakeholder Engagement on EIR / EMP	November / December 2009
Finalise EIR and EMP	January 2010
Submission to Relevant Authorities	January 2010
Environmental Authorisation	April 2010
Appeal Period	To be confirmed after the Environmental Authorisation
Construction (including EMP Auditing)	To be confirmed after the Environmental Authorisation