# ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
# FINAL EIA REPORT
# PROPOSED TRANSALLOYS POWER PLANT AND ASSOCIATED INFRASTRUCTURE, MPUMALALANGA PROVINCE

## DEA REFERENCE NUMBER: 14/12/16/3/3/3/97

FINAL EIA REPORT

**MAY 2015**

**Prepared for:**

Transalloys
10344 Clewer Road,
Emalahleni

**Prepared by:**


Savannah Environmental Pty Ltd

UNIT 10, BUILDING 2,
5 WOODLANDS DRIVE OFFICE PARK
CNR WOODLANDS DRIVE &
WESTERN SERVICE ROAD,
WOODMEAD, GAUTENG
P.O. BOX 148, SUNNINGHILL, 2157
TELEPHONE : +27 (0)11 656 3237
FACSIMILE : +27 (0)86 684 0547
EMAIL : INFO@SAVANNAHSA.COM

## *PROJECT DETAILS*

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|---|---|---|
| **DEA Reference Number** | : | 14/12/16/3/3/3/97 |
| **Title** | : | Environmental Impact Assessment Process<br>Final EIA Report: Proposed Establishment Of A Coal-Fired Power Station And Associated Infrastructure at Transalloys near eMalahleni, Mpumalanga Province |
| **Authors** | : | Savannah Environmental (Pty) Ltd:<br>Steven Ingle<br>Jo-Anne Thomas |
| **Sub-consultants** | : | Airshed Planning Professionals<br>Heritage Contracts and Archaeological Consulting CC<br>M2 Environmental Connections CC (Menco)<br>Jones & Wagener<br>Tony Barbour<br>Johann Lanz<br>MetroGIS<br>Enviro Acoustic Research<br>Siyazi |
| **Project developer** | : | Transalloys (Pty) Ltd |
| **Report Status** | : | Final EIA Report |

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## PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Transalloys (Pty) Ltd, a producer of export grade Siliconmanganese[1], as an energy intensive electricity user, proposes to develop a Coal-Fired Power Plant and associated infrastructure adjacent to its smelter complex near eMalahleni, Mpumalanga Province.

The proposed power plant will have a net generating capacity of between 55MW and 150 MW in order to meet Transalloys' current electricity demands and future expansion requirements. The development of the power plant project would effectively mean that Transalloys would become independent of the Eskom electricity grid, thereby creating additional capacity within the Eskom grid for use by other electricity users.

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for environmental authorisation. The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The EIA Phase addresses the identified potential environmental impacts and benefits associated with all phases of the project including design, construction, operation and decommissioning and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

This EIA Report assesses this proposed project and consists of ten chapters, which include:

» **Chapter 1** provides background to the proposed project and the environmental impact assessment.
» **Chapter 2** outlines the strategic legal context for the energy planning and the proposed project
» **Chapter 3** provides a description of the proposed project.
» **Chapter 4** provides details of the alternatives considered for the proposed project.
» **Chapter 5** outlines the process which was followed during the EIA process.
» **Chapter 6** describes the existing biophysical and socio-economic environment affected by the proposed project.
» **Chapter 7** provides an assessment of the potential issues and impacts associated with the proposed project and presents recommendations for mitigation of significant impacts.
» **Chapter 8** provides an assessment of cumulative impacts.

[1] Silicomanganese (SiMn), a ferroalloy with high contents of manganese and silicon, is made by heating a mixture of the oxides manganese oxide ($MnO_2$), silicon dioxide (SiO2), and iron oxide ($Fe_2O_3$), with carbon in a furnace. They undergo a thermal decomposition reaction. It is used as a deoxidizer and an alloying element in steel.

» **Chapter 9** presents the conclusions and recommendations based on the findings of the EIA.
» **Chapter 10** provides references used to compile the EIA Report.

The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. The Final EIA Report has incorporated all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project.

## INVITATION TO COMMENT ON THE DRAFT EIA REPORT

The Draft Environmental Impact Assessment Report for the proposed Transalloys Power Plant was made available for a 40 - day public review and comment period at the following public places within the project area from 30 March 2015 – 14 May 2015:

- Clewer Post Office
- Clewer Primary School
- Transalloys Reception Area
- Witbank Public Library (eMalahleni Main Library)

The report is also made available on:

- www.savannahSA.com

## PUBLIC FEEDBACK MEETING

In order to facilitate comments on the draft EIA report and provide feedback on the findings of the studies undertaken, all interested and affected parties were invited to attend a public meeting on 6 May 2015, held at the Clewer Primary School, Clewer, eMalahleni.

# EXECUTIVE SUMMARY

## Project Information

Transalloys (Pty) Ltd, a producer of export grade Siliconmanganese, as an energy intensive electricity user, proposes to develop a Coal-Fired Power Plant and associated infrastructure adjacent to its smelter complex near eMalahleni, Mpumalanga Province.

The proposed power plant will have a net generating capacity of between 55MW and 150 MW in order to meet Transalloys' current electricity demands. Transalloys has determined, that due to the current unreliable supply of electricity and projected future cost of electricity, that the business will suffer significant financial losses. This could potentially have a significant impact on the viability of the business, potentially leading to job losses and even closure. The development of the proposed power plant project would effectively mean that Transalloys would become partially independent of the Eskom electricity grid, thereby creating additional capacity within the Eskom grid for use by other electricity users and providing greater confidence in supply of energy for operational purposes.

Following detailed technical investigations conducted for the 150MW power station during the preparation of this EIA report, and the associated cost and potential environmental impacts associated with its development, Transalloys opted to investigate the feasibility of a smaller 55MW power station. The development of a power plant of up to 150MW has been assessed in this EIA, however, based on a re-evaluation of the need and desirability, as well as the potential environmental impact of the 150MW alternative on some environmental aspects, a reduction in the generating capacity of the plant to 55MW is proposed to meet Transalloys' current electricity demands and future expansion requirements.

The smaller 55MW plant will consist of a decommissioned power plant, currently situated in Austria, Europe. The plant is proposed to be dismantled, refurbished and shipped to South Africa, whereupon the dismantled components will be erected on site and the necessary services installed. The re-design of components will be undertaken where necessary in order to ensure successful relocation and establishment on the site. The service provider will also undertake the commissioning and eventual handover of the 55MW power plant to Transalloys. A residual life expectancy of 30 years is estimated for the 55MW plant at its new proposed location with continued maintenance. The power plant will be equipped with a gas cleaning facility in order to meet local emissions standards.

The main infrastructure that is required for the Transalloys coal-fired power station therefore includes:

- Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room).
- Ash disposal facility and runoff leachate collection ponds.
- Dams for storage and separation of "clean" and "dirty" water.
- Raw water pipeline.
- Coal and limestone offloading and storage areas.
- Ash silos.
- Facility conveyor belts.
- Water and wastewater treatment facilities and raw water reservoir.
- Evaporation pond.
- A 33kV overhead power line from the switchyard to connect into the existing Transalloys Substation.
- General and hazardous waste storage area.
- Internal access roads.
- Other operational support and administrative buildings.

## Evaluation of the Proposed Project

Various project site alternatives were considered for the development of the proposed project and site alternatives 1 and 2 were selected on the basis of technical and environmental suitability. For the power station itself, 55MW and 150MW design alternatives have been contemplated.

Impacts associated with the project relate to the following:

- ***Biodiversity impacts*** associated with the construction of the power station and associated infrastructure. While most of the expected impacts associated with this development to the actual footprint will be unavoidable, the success of mitigation will be determined by the success of preventing impacts from spreading outside the footprints of the development. Aspects such as infestation of surrounding habitat by alien and invasive species, the introduction of non-endemic and invasive animals, dust, effluents, contamination, hydro-carbons spillages, etc. will represent the ultimate challenge of the environmental management plan as these aspects will cause the spread and exacerbation of impacts into the natural environment caused by the development. The major objective of the environmental management programme of the development should therefore be the complete prevention and containment of any impact from the development that might cause harm to areas of surrounding natural habitat, with particular emphasis on avoiding or limiting impacts as far as possible on the aquatic environment (i.e. the Brugspruit and its western tributary as well as the wetlands in the area).

  Ultimately, the expected loss of natural resources from the site and immediate surrounds as a result of the development will result in impacts of low significance and

will be highly localised. No protected plant and animal species were identified in the study area which will be adversely affected by the proposed project.

Impacts of a cumulative nature, although estimated to result in moderate and low significance, represent a continuous, low level threat to biodiversity on a local and regional scale. The increase in industrial and mining activity in the region implies constant losses of natural habitat and species. This is exacerbated by the decline in environmental quality caused by peripheral and indirect impacts such as species invasion, degradation, contamination, disruption of ecological processes, habitat fragmentation and isolation, etc.

In conclusion however, no specific impact was identified that would render the proposed development as an unacceptable threat to the biological environment or any specific aspect or species that are known to occur, or could potentially occur within the study area or required servitudes, provided that detailed, comprehensive and sensible environmental management principles are applied throughout the lifetime of the operation.

» ***Impacts on Soils and Agricultural Potential*** associated with the construction phase (soil loss and erosion) and the operational phase (permanent loss of agricultural land). The development of the power station will have **low to medium negative impact** on agricultural resources and productivity. The significance of all agricultural impacts is influenced by the fact that the land potential is limited due to soil depth and moisture holding constraints and pressures in terms of mining use. Erosion potential could increase in areas disturbed on the site during construction unless appropriate mitigation is implemented. Impacts in this regard are however expected to be of **low significance**.

» ***Impacts on Surface and Groundwater Resources*** related to construction and operation of the power station. Impacts on water resources are related to quality and quantity. Impacts on water quantity are not expected as water is not proposed to be abstracted from a natural resource in the area, but will rather be obtained from nearby industrial water users with a water surplus. As proposed for the project, the implementation of dry cooling and dry ashing is the preferred technology in order to minimise water required thereby reducing impacts on water resources. Impacts on water quality relate to sedimentation and contamination during both the construction and operational phases of the project. These impacts can be successfully managed through the implementation of appropriate mitigation and management measures, such as liners for the ash disposal facility and coal stockpile areas, and implementation of dust suppression measures on exposed surfaces. Impacts on water resources are expected to be of **Medium to Low significance**. On-going water quality monitoring throughout the operational phase is required to be undertaken.

***Impacts on wetlands*** associated with the construction of the power station and associated infrastructure. Five wetlands were identified in the study area of the valley bottom (associated with the Brugspruit) and hillslope seepage variety. While a significant impact is expected over a section of hillslope seepage wetland identified on the project site for the siting of the ash disposal facility (for the 150MW design alternative), the loss of the wetland was deemed to constitute acceptable loss, due to the degraded present ecological state of the wetland and the opportunity to rehabilitate other nearby wetlands of conservation value as a mitigating condition of the project. The overall impact on the wetland proposed to be lost to development will however remain **High significance**. This impact is in itself mitigated by the development of the 55MW design alternative, which does not require the siting of the ash disposal facility within delineated wetland systems.

» ***Impacts on air quality and human health*** associated with the construction phase (dust) and the operational phase (emissions from the power station and PM from the ash disposal facility). The area is dominated by winds from the east and east-south-east. Impacts associated with the construction phase will be limited largely to the Transalloys smelter complex with no exceedences at the air quality sensitive receptors. Impacts are expected to be of **low significance**. Impacts during operation relate to dust from the ash disposal facility and coal stockpile as well as emissions ($SO_2$, $NO_2$ and $PM_{10}$) from the power station. From the results of the modelling undertaken, the release of $PM_{2.5}$, $PM_{10}$ and $NO_2$ during the operational phase are expected to result in exceedances of both long term (annual) and short term (1-hour and/or 24-hour) ambient air quality criteria off-site. Furthermore, dustfall as a result of unmitigated PM emissions is expected to exceed the criteria for residential areas at the closest residences of Clewer. Impacts are expected to be of **medium significance** when unmitigated for all emissions. Development of the 55MW design alternative are unlikely to result in adverse air quality impacts at the identified receptors.

» ***Noise impacts*** associated with the construction (short-term) and operational (long-term) phases. Impacts are expected to be more significant during the night (22:00 – 06:00) than during the daytime (i.e. 06:00 – 22:00). Impacts during the construction phase are expected to be of **low significance** while impacts during the operational phases are also considered to be of **low significance** due to the existing ambient noise conditions. No mitigation or routine noise monitoring is therefore required in the operation phase of the facility.

» ***Visual impacts*** associated with the 150MW power station and associated infrastructure. Potential visual impacts are expected to be of **Medium significance** and mostly restricted to within 10km of the site. The consolidation of the proposed infrastructure in areas of existing visual disturbance is however preferred (as

proposed by the current siting and layout arrangements), rather than the distribution thereof over larger areas. The visual impact is further mitigated if the 55MW design alternative is developed resulting in a much reduced visual profile of the project.

» ***Impacts on Heritage Sites*** during the construction phase. A cemetery, two initiation sites and the demolished remains of structures were identified during the heritage survey, of which the latter are not considered to be of heritage significance. The cemetery and initiation sites will not be impacted by construction activities. Impacts to the heritage environment are considered to be of **low significance**. From an archaeological point of view there is no reason why the development should not proceed.

» ***Traffic impacts*** associated with construction and operation of the power station. The traffic volumes generated by the proposed Transalloys Power Station development will have an additional impact on the external road network. The potential impact is considered to vary significantly between the 55MW and 150MW design alternatives. However road improvements are expected to be required irrespective of whether the proposed development continues or not in order to address access and safety provisions. Furthermore the onus is on the relevant roads authorities to address the recommended road improvements. It is expected that this will be done in light of the number of proposed mining projects in the area. It is recommended that Transalloys engage the traffic authorities in order to determine expectations in this regard.

» ***Socio-economic impacts*** expected during both the construction and operation phases of the proposed project. The construction and operation of the power station is expected to have both negative and positive social and economic effects. From a socio-economic perspective, the positive effects in terms of construction, operation, and decommissioning of the coal-fired power plant include an increase in national electricity capacity (or relief to the Eskom grid), economic development, job creation, increase in household income, and government revenue.

The town of Clewer is the most directly affected social receptor which will be the most prone to impacts arising from air quality, noise and visual impacts. These impacts are expected to be mitigated to a large extent through the development of the 55MW design alternative over the 150MW design alternative.

Considering that many of the negative impacts will also be possible to mitigate, although not completely eliminate, the trade-offs between negative and positive effects suggest that from the socio-economic perspective the project should be approved for development. It will contribute to achieving local and national government developmental objectives at a relatively limited cost. Nonetheless, it is imperative that the construction, operation, and decommissioning of the project

should be conducted in the most sustainable way with the primary objective of minimising, and where feasible, completely eliminating the potential for deterioration of human livelihoods, reducing business turnover, and altering the environment in the proposed area.

» ***Cumulative impacts:*** Transalloys is situated in the Highveld Energy Hub Area (Zone A) according to the Environmental Management Framework for the Olifants and Letaba River Catchment Areas (OLEMF), which describes this zone as representing the current "powerhouse" of South Africa, housing extensive coal fields, numerous large coal mines, coal-fired power stations and several major industries and towns that are located in the area.

» The proposed Transalloys power station site is situated near to the following industrial / mining facilities:
  - The existing Transalloys siliconmanganese smelter complex (adjacent)
  - Evraz Highveld Steel and Vanadium which is a producer of steel and vanadium products (within 2km).
  - The proposed Anglo Coal Landau Colliery Life Extension Project (new pits within 1km west of Transalloys)
  - The proposed Izazi Colliery on Portions 26, 36, 37 and a portion of portion 46 of the farm Elandsfontein 309 JS (within 1km east of Transalloys).
  - A proposed colliery on Portion 25 of the farm Elandsfontein 309 JS (within 1km east of Transalloys).
  - The existing AngloAmerican Landau Colliery (within 5km to the south-east)
  - The proposed Khanyisa Coal Fired Power Station (450MW) within the South African Coal Estates Complex (including the Greenside, Kleinkopje and Landau Collieries).
  - Existing power stations including the soon to be operational Eskom Kusile Power Station situated less than 20km to the west and the Eskom Duvha Power Station within 22km to the south-east.

  The development of the proposed Transalloys Power Plant along with the development of the abovementioned projects will have negative and positive cumulative environmental, social and economic impacts. It is essential that each new coal-fired power station and related coal-developments (such as new coal mines) subscribe to sound environmental management during these projects life-cycle (construction, operation, decommissioning and rehabilitation phases). This would require input from regulating authorities and applicants during the development of coal and power station projects in the region to ensure that cumulative environmental impacts are managed to acceptable levels.

» ***Impacts associated with waste treatment and management activities:*** Impacts associated with waste treatment and management activities relate to

those associated with the ash disposal facility and the wastewater treatment works. Potential impacts on surface and groundwater are anticipated should appropriate mitigation measures not be implemented. In terms of the assessment of impacts undertaken within this EIA study, Impacts on water resources are expected to be of **Medium to Low significance**. On-going water quality monitoring throughout the operational phase is required to be undertaken. In addition, an appropriate Integrated Water and Waste Management Plan (IWWMP) and Stormwater Management Plan must be developed and implemented for all phases of the proposed project.

The development of the entire 55MW project footprint (as well as ash disposal facility) on site 1 , thereby excluding site 2 from the development area, will in itself serve as mitigation of virtually all environmental impacts included in this assessment to a large extent. From this perspective the 55MW alternative is considered to be preferred.

From the conclusions of the specialist studies undertaken, it is concluded that the impacts associated with the construction and operation of the power plant and associated infrastructure are expected to be of Medium to Low significance with the implementation of appropriate mitigation measures (with one remaining impact of high significance). No environmental fatal flaws were identified to be associated with the proposed project.

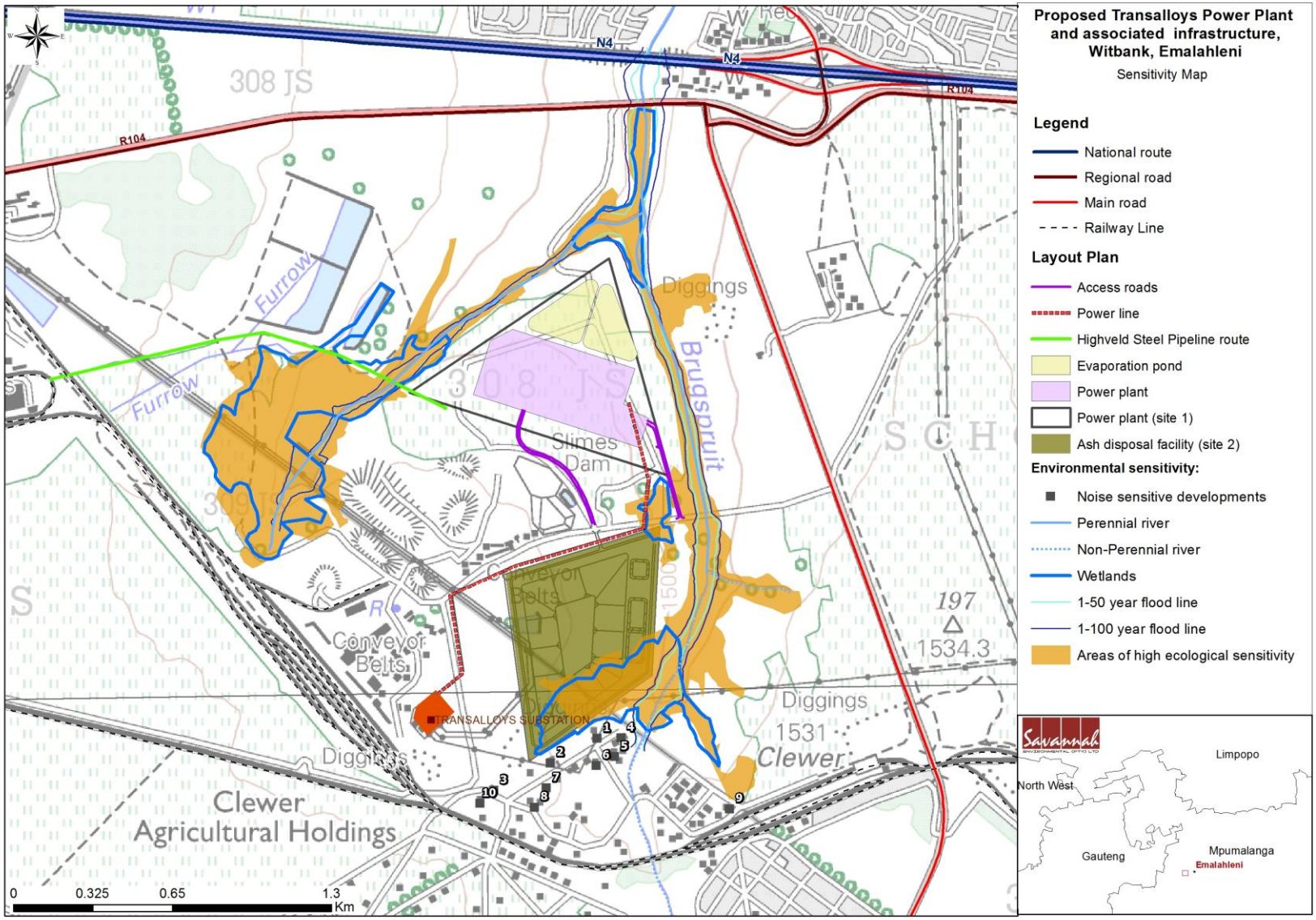


**Figure 1:** Environmental Sensitivity Map overlay of 150MW power plant alternative

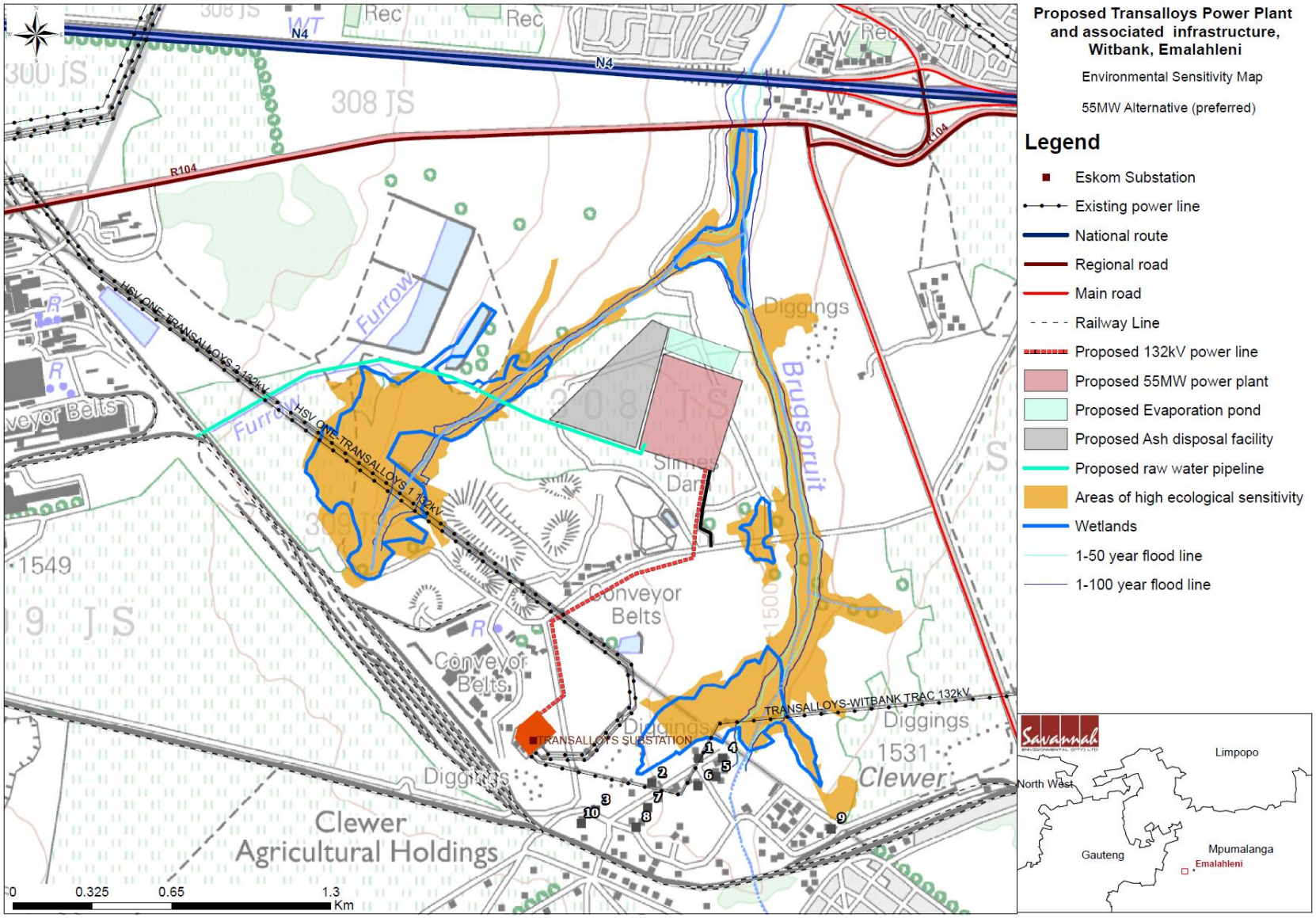


**Figure 2:** Environmental Sensitivity Map overlay of 55MW power plant alternative (preferred)

## Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Transalloys Power Station and associated infrastructure be authorised by DEA.

Should authorisation for the power station be granted, the following conditions must be included within the authorisation issued:

Preferred alternative

» That the 55MW design alternative be authorised due to lower overall footprint requirements and associated environmental impacts.

Management and compliance monitoring

» All mitigation measures detailed within this report and the specialist reports contained within Appendices E to O must be implemented.
» The draft Environmental Management Programme (EMPr) as contained within Appendix P of this report must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.
» An independent Environmental Control Officer (ECO) must be appointed by the project developer prior to the commencement of any authorised activities. The ECO must monitor compliance with all applicable environmental legislation and requirements throughout the construction phase.

Design

» The infrastructure should be limited to Site Alternative 1 as far as reasonably possible.
» Following the final design of the facility, a final layout indicating all relevant infrastructure and affected areas (permanent and temporary) must be submitted to DEA for review and approval prior to commencing with construction. This layout must consider all sensitive areas identified within the site.
» Develop and implement a stormwater management plan for the stormwater and water pollution control facilities such as Pollution Control Dams and storm water drainage system. Pollution control infrastructure is required to be designed in accordance with Regulation 636 of August 2013 published in terms of the NEM: Waste Act (Act No 59 of 2008).

» An appropriate liner system must be installed at the ash disposal system to be designed in accordance with Regulation 636 of August 2013 published in terms of the Waste Act.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.

Biodiversity maintenance and integrity
» A detailed Alien and Invasive Plant Management Plan must be developed and implemented throughout the project cycle up to the decommissioning phase.
» A rehabilitation programme that makes use of locally endemic or indigenous species must be developed and implemented.

Air quality management
» Design and implement an air quality management plan for the operational phase of the power station. This should include ambient air quality monitoring and an emission control and reduction strategy to ensure that the contribution to ambient concentrations is minimised. Cognisance of the management plan for the Highveld Priority Area is taken cognizance of.

Surface water and wetlands
» Transalloys should continue with its surface water monitoring programme to ensure that it can characterise its impact on the Brugspruit and its tributary.
» A stormwater management plan demonstrating the separation of clean and dirty stormwater flows must be prepared.
» A Water Use License must be obtained from the Department of Water and Sanitation.

Groundwater
» The current groundwater monitoring program must continue in order to accurately determine the impacts that the new plant will have on the groundwater quality downstream.
» Material from the coal stockpile and ash disposal facility should be submitted for geochemical analysis to determine the leachability, acid generation capacity and contamination potential of each.

Waste management
» Monitoring of waste treatment and management facilities throughout all phases of the project should be undertaken.
» An Integrated Water and Waste Management Plan (IWWMP) for all phases of the project should be developed.

Noise monitoring

» No mitigation or routine noise monitoring is required in the operation phase of the facility however if noise measurements are conducted annual feedback should be presented to all stakeholders and other Interested and Affected parties in the area.

Traffic management

» Develop and implement a traffic management plan for the construction and operational phases of the power station. This is of particular importance should the recommended traffic/intersection improvements not be effected timeously by the appropriate roads authorities.

Heritage

» Ensure that construction phase impacts on the cemetery site are avoided. Fence the cemetery site and provide an access gate for family members.

Social impacts

» During the design and construction phase the developer should meet with local communities (Clewer) to determine their concerns and take into consideration any mitigating proposals.
» Increase the local procurement practices and employment of people from local communities as far as feasible to maximize the benefits to the local economies.

Mineral consent

» A Section 53 Application should be submitted to the DoE to ensure that proposed activities do not sterilise a mineral resource that might occur on site.

Pre-construction

» Prior to construction of the water pipeline, a survey of the pipeline route should be undertaken to determine whether any protected plant species are present in the servitude, namely *Satyrium longicauda.* A permit for the removal of this species should be sought if detected.

Rehabilitation and operations

» Site rehabilitation of temporary laydown and construction areas are to be undertaken immediately after construction.
» The process of communication and consultation with the community representatives must be maintained after the closure of this EIA process, and, in particular, during the construction phase associated with the proposed project.

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| BID | Background Information Document |
| $CO_2$ | Carbon dioxide |
| CFB | Circulating Fluidised Bed |
| DEA | National Department of Environmental Affairs |
| DoE | Department of Energy |
| DWAS | Department of Water Affairs and Sanitation |
| EAP | Environmental Assessment Practitioner |
| EIA | Environmental Impact Assessment |
| EMPr | Environmental Management Programme |
| GDP | Gross Domestic Profit |
| GIS | Geographical Information Systems |
| GG | Government Gazette |
| GN | Government Notice |
| GHG | Green House Gases |
| GWh | Giga Watt Hour |
| Ha | Hectare |
| I&AP | Interested and Affected Party |
| IDP | Integrated Development Plan |
| IPP | Independent Power Producer |
| $km^2$ | Square kilometres |
| km/hr | Kilometres per hour |
| kV | Kilovolt |
| MAR | Mean Annual Rainfall |
| $m^2$ | Square meters |
| m/s | Meters per second |
| MW | Mega Watt |
| NEMA | National Environmental Management Act (Act No. 107 of 1998) |
| NERSA | National Energy Regulator of South Africa |
| NHRA | National Heritage Resources Act (Act No. 25 of 1999) |
| NGOs | Non-Governmental Organisations |
| NWA | National Water Act (Act No. 36 of 1998) |
| SAHRA | South African Heritage Resources Agency |
| SANBI | South African National Biodiversity Institute |
| SANRAL | South African National Roads Agency Limited |
| SDF | Spatial Development Framework |

## *DEFINITIONS AND TERMINOLOGY*

**Alternatives:** Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

**Commercial Operation date:** The date after which all testing and commissioning has been completed and is the initiation date to which the seller can start producing electricity for sale (i.e. when the project has been substantially completed).

**Commence:** The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

**Commissioning:** Commissioning commences once construction is completed. Commissioning covers all activities including testing after all components of the power plant are installed.

**Construction:** Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

**Cumulative impacts:** Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

**Decommissioning:** To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

**Direct impacts:** Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually

associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

**'Do nothing' alternative:** The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

**Endangered species:** Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

**Emergency:** An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

**Endemic:** An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

**Environment:** the surroundings within which humans exist and that are made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

**Environmental impact:** An action or series of actions that have an effect on the environment.

**Environmental impact assessment:** Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

**Environmental management:** Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

**Environmental management programme:** An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

**Hazardous waste:** Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (Van der Linde and Feris, 2010;pg 185).

**Heritage:** That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

**Indigenous:** All biological organisms that occurred naturally within the study area prior to 1800

**Indirect impacts:** Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

**Interested and affected party:** Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

**Method statement:** A written submission to the ECO and the site manager (or engineer) by the EPC Contractor in collaboration with his/her EO.

**No-go areas:** Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

**Pollution:** A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

**Pre-construction:** The period prior to the commencement of construction, this may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

**Ramsar convention on wetlands:** "The Convention on Wetlands (Ramsar, Iran, 1971) is an intergovernmental treaty whose mission is "the conservation and wise use of all wetlands through local, regional, and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world." As of March 2004, 138 nations have joined the Convention as Contracting Parties, and more than 1300 wetlands around the world, covering almost 120 million hectares, have been designated for inclusion in the Ramsar List of Wetlands of International Importance." (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition, Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (Refer http://www.ramsar.org/). South Africa is a Contracting Party to the Convention.

**Red data species:** Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

**Significant impact:** An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

**Waste:** Any substance, whether or not that substance can be reduced re-used, recycled and recovered; that is surplus, unwanted, rejected, discarded, abandoned or disposed of which the generator has no further use for the purposes of production. Any product which must be treated and disposed of, that is identified as waste by the minister of Environmental affairs (by notice in the Gazette) and includes waste generated by the mining, medical or other sectors, but: A by-product is not considered waste, and portion of waste, once re-used, recycled and recovered, ceases to be waste (Van der Linde and Feris, 2010; pg 186).

# INTRODUCTION CHAPTER 1

Transalloys (Pty) Ltd, a producer of export grade Siliconmanganese[2], as an energy intensive electricity user, proposes to develop a Coal-Fired Power Plant and associated infrastructure adjacent to its smelter complex near eMalahleni, Mpumalanga Province.

The proposed power plant will have a net generating capacity of 55MW in order to meet Transalloys' current electricity demands and future expansion requirements[3]. The development of the power plant project would effectively mean that Transalloys would become independent of the Eskom electricity grid, thereby creating additional capacity within the Eskom grid for use by other electricity users.

As the project has the potential to impact on the environment, an Environmental Impact Assessment (EIA) process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction of the project. This EIA Report assesses this proposed project and consists of ten chapters, which include:

» **Chapter 1** provides background to the proposed project and the environmental impact assessment.
» **Chapter 2** outlines the strategic legal context for the energy planning and the proposed project
» **Chapter 3** provides a description of the proposed project.
» **Chapter 4** provides details of the alternatives considered for the proposed project.
» **Chapter 5** outlines the process which was followed during the EIA process.
» **Chapter 6** describes the existing biophysical and socio-economic environment affected by the proposed project.
» **Chapter 7** provides an assessment of the potential issues and impacts associated with the proposed project and presents recommendations for mitigation of significant impacts.

[2] Silicomanganese (SiMn), a ferroalloy with high contents of manganese and silicon, is made by heating a mixture of the oxides manganese oxide ($MnO_2$), silicon dioxide (SiO2), and iron oxide ($Fe_2O_3$), with carbon in a furnace. They undergo a thermal decomposition reaction. It is used as a deoxidizer and an alloying element in steel.

[3] Following detailed technical investigations conducted for the 150 MW power station during the preparation of this EIA report, and the associated cost and potential environmental impacts associated with its development, Transalloys made a decision to investigate the feasibility of the construction of a smaller 55MW power station. The potential impact of a 150 MW power plant has been fully assessed and therefore represents the worst-case scenario on this basis.

» **Chapter 8** provides an assessment of cumulative impacts.
» **Chapter 9** presents the conclusions and recommendations based on the findings of the EIA.
» **Chapter 10** provides references used to compile the EIA Report.

## 1.1. Project Overview

**Project description:** The Transalloys coal-fired power plant, proposed to be constructed adjacent to the existing Transalloys smelter complex will have a generating capacity of up to 55MW in order to meet Transalloys' current electricity demands and future expansion requirements. The plant will be a captive generating plant whereby generated electricity will be fed directly into the smelter complex for direct consumption, at which point Transalloys will essentially become independent of the Eskom electricity grid. The power station will utilise Circulating Fluidised Bed CFB combustors (boilers) which have the advantage that sulphur trapping can take place with the sorbent bed (limestone) in these boilers, ensuring a plant with relatively low emissions. In addition, the power station will utilise dry cooling technology and dry ashing due to water availability constraints. Various potential coal supply sources have been identified by Transalloys, including sources from as close as the neighbouring Landau Colliery to sources in Middleburg.

**Location:** The existing Transalloys smelter complex is located within 8km west of eMalahleni (formerly Witbank) in the eMalahleni Local Municipality within the greater Nkangala District Municipality of the Mpumalanga Province. The Transalloys smelter complex is located south of the N4 highway within 700m from the Clewer Agricultural Holdings to the south, within 1.5km from the town of Clewer to the south east and within 1km from the EVRAZ Highveld Steel works to the north-west.

**Project siting:** Five alternative sites for the siting of the power plant, associated infrastructure and the ash disposal facility were considered during the Scoping phase, the primary criteria for their selection being their size and proximity to the Transalloys smelter complex. The ownership of these sites is distributed between Transalloys, Highveld Steel and AngloAmerican (Landau Colliery). Following an evaluation of the five available areas during the scoping phase, environmentally preferred areas were identified for assessment against project technical criteria. The preferred project sites (for the siting of the power plant and ash disposal facility) are situated on Transalloys owned land (refer to Figure 1.1). A preliminary layout of the infrastructure for the power station is provided in Appendix A.

**Need for the project:** At a National level, the demand for electricity in South Africa has grown, on average, at more than 4% over the past few years, with a simultaneous reduction in the surplus generating capacity due to limited commissioning of new generation facilities and the ageing infrastructure currently owned and operated by Eskom.

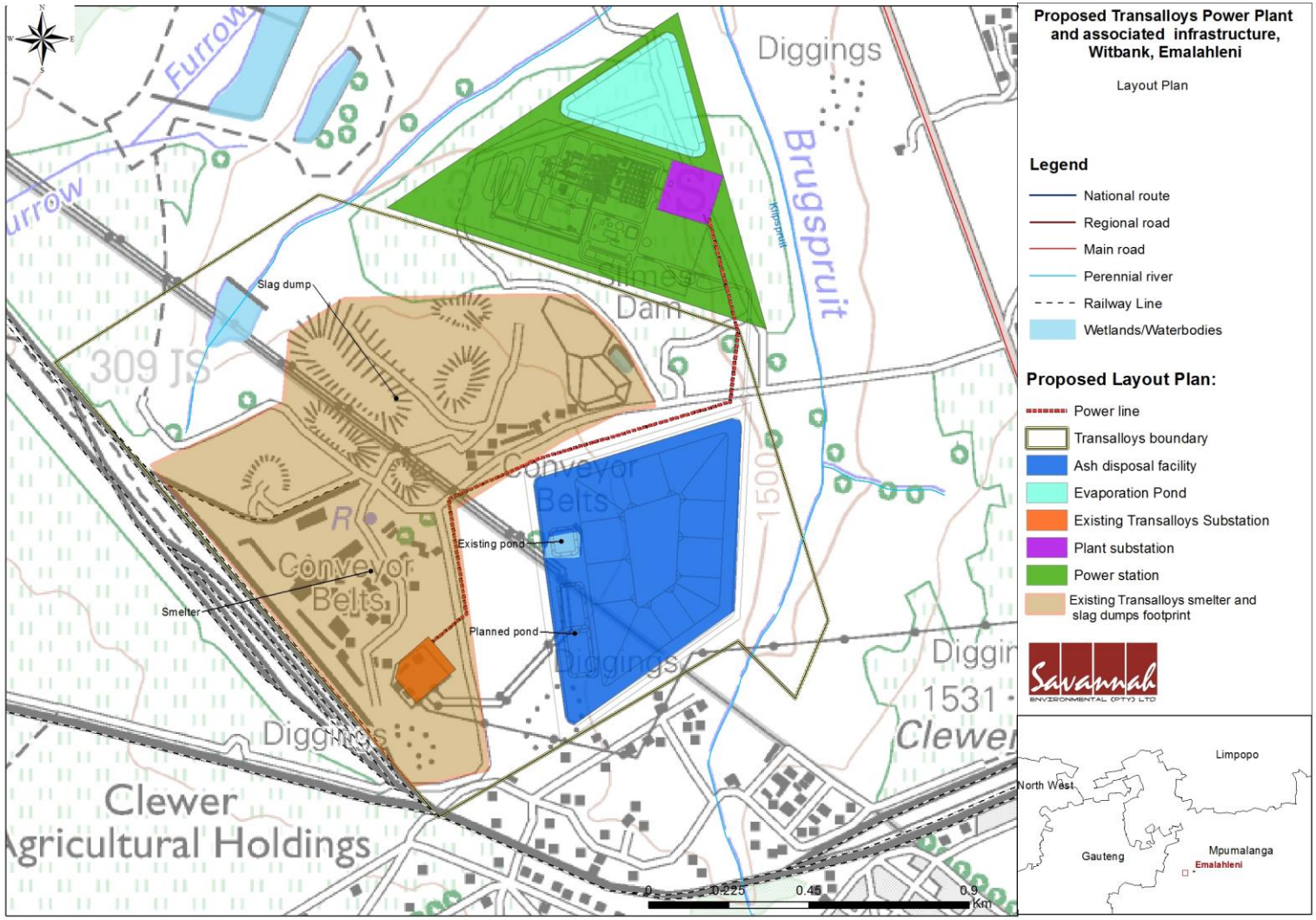



**Figure 1.1:** Locality map showing the proposed area for the establishment of the Transalloys 150MW coal-fired power station relative to the Transalloys smelter complex, Mpumalanga Province. Note that the layout provided is a representation of the 150 MW worst-case scenario and a much reduced footprint will be required for the 55MW power plant, which can be located within the green triangle.

The Integrated Resource Plan (IRP) 2010 developed by the South African Department of Energy (DoE) projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic development and ensure adequate reserves over the next twenty years. The required expansion is more than two times the size of the existing capacity of the system.

In December 2012, the Minister announced determinations regarding the expansion of electricity generation capacity by Independent Power Producers (IPPs), including additional base-load generation capacity of 7 761 MW, comprising of:

- 2 500 MW of energy from coal for connection to the grid between 2014 and 2024 under the Coal Baseload IPP Procurement Programme;
- 2 652 MW of gas power for connection to the grid between 2021 and 2025; and
- 2 609 MW of imported hydro power from regional projects for connection to the grid between 2022 and 2024.

On 26 June 2014 the DoE formally released a request for registration ("RFR") to prospective independent power producers who anticipated submitting a bid response in the Coal Baseload IPP Procurement Programme ("Programme"). The Request for Proposal (RfP) was released by the DoE in December 2014 in terms of which coal baseload projects are required to be bid by June 2015. While Transalloys submitted an RFR, the decision to participate in the DoE programme will be based on commercial considerations.

**Project infrastructure:** The main infrastructure that is required for the Transalloys coal-fired power station (50 MW plant) includes:

- Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room).
- Ash disposal facility and runoff ponds.
- Dams for storage and separation of "clean" and "dirty" water.
- Raw water pipeline.
- Coal and limestone offloading and storage areas.
- Ash silos.
- Facility conveyor belts.
- Water and wastewater treatment facilities and raw water reservoir.
- Evaporation pond.
- A 33kV overhead power line from the switchyard to connect into the existing Transalloys Substation.
- General and hazardous waste storage area.
- Internal access roads.

» Other operational support and administrative buildings.

More details regarding the proposed project are included within Chapters 3 and 4 of this EIA Report.

## 1.2. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was contracted by Transalloys as an independent consultant to undertake the required Environmental Impact Assessment (EIA) for the proposed project, as required by the NEMA EIA Regulations of June 2010. Neither Savannah Environmental, nor any of its specialist sub-consultants on this project are subsidiaries of / or affiliated with Transalloys. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

The Savannah Environmental staff and sub-consultants have acquired considerable experience in environmental assessment and environmental management over the last 9 years, and have been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa. Strong competencies have been developed in project management of environmental EIA processes, as well as strategic environmental assessment and compliance advice, and the identification of environmental management solutions and mitigation/risk minimising measures. Savannah Environmental has successfully completed various EIAs for transmission power lines, as well as EIAs for several substations, distribution power lines and power generation projects for Eskom Holdings Limited and other Independent Power Producers.

Jo-Anne Thomas, is a registered Professional Natural Scientist (in the practice of environmental science) with the South African Council for Natural Scientific Professions. She has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation and transmission projects through her involvement in related EIA processes over the past sixteen (16) years. She has successfully managed and undertaken EIA processes for electricity generation projects throughout South Africa. She is supported by Steven Ingle and Gabriele Wood from Savannah Environmental. In order to adequately identify and assess potential environmental impacts as well as evaluate alternatives, Savannah Environmental has appointed several specialist consultants to conduct specialist studies, as required. Details of these specialist studies are included in Chapter 5.

# STRATEGIC CONTEXT FOR ENERGY PLANNING CHAPTER 2

## 2.1 National Policy and Planning Context

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Energy (DoE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as solar energy facilities is illustrated in **Figure 2.1**.

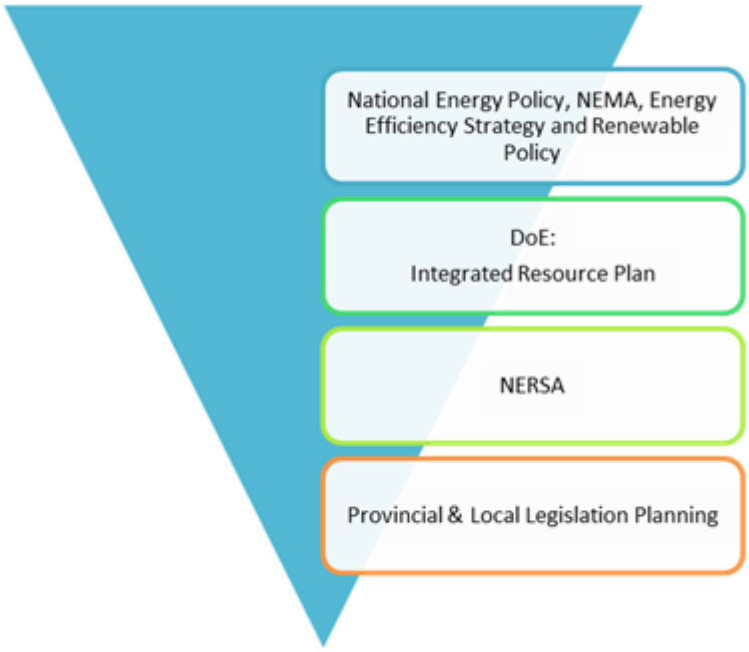



**Figure 2.1:** Hierarchy of electricity policy and planning documents

These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the proposed development.

### *2.1.1 The National Energy Act (2008)*

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors. The Act provides the legal framework which supports the development of power generation facilities.

### *2.1.2 White Paper on the Energy Policy of South Africa, 1998*

The South African Energy Policy, published in December 1998 by the Department of Minerals and Energy (DME) identifies five key objectives, namely:

» Increasing access to affordable energy services;
» Improving energy sector governance;
» Stimulating economic development;
» Managing energy-related environmental impacts; and
» Securing supply through diversity.

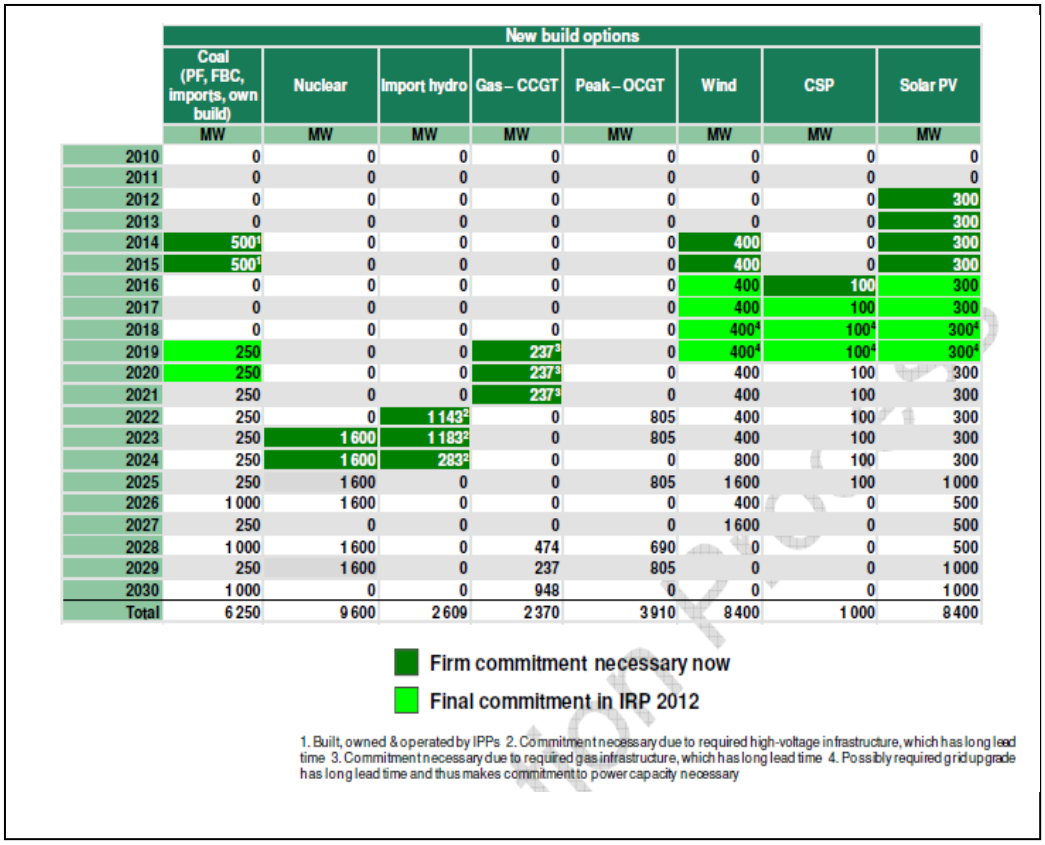
In order to meet these objectives and the developmental and socio-economic objectives in South Africa, the country needs to optimally use the available energy resources. The South African Government is required to address what can be done to meet these electricity needs both in the short- and long-term. The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversity.

### *2.1.3 Final Integrated Resource Plan, 2010 - 2030*

The Integrated Resource Plan (IRP) 2010-30 was promulgated in March 2011. The primary objective of the IRP 2010 is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. However, the IRP 2010 also serves as input to other planning functions, *inter alia* economic development, and funding, environmental and social policy formulation. The accuracy of the IRP 2010 is to be improved by regular reviews and updates, and a draft revised Plan is currently available for public comment. The IRP 2010 projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic devlopment and ensure adaquate reserves over the next twenty years. The required expansion is more than two times the size of of the existing capacity of the system.

The current iteration of the Integrated Resource Plan (IRP) for South Africa, initiated by the Department of Energy (DoE) after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. The document outlines the proposed generation new build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on the cost-optimal solution for new build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation. In addition to all existing

and committed power plants, the RBS included a nuclear fleet of 9.6 GW; **6.3 GW of coal**; 17.8 GW of renewables; and 8.9 GW of other generation sources.



| | New build options | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Coal (PF, FBC, imports, own build) | Nuclear | Import hydro | Gas – CCGT | Peak – OCGT | Wind | CSP | Solar PV |
| | MW | MW | MW | MW | MW | MW | MW | MW |
| 2010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 300 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 300 |
| 2014 | 500[1] | 0 | 0 | 0 | 0 | 400 | 0 | 300 |
| 2015 | 500[1] | 0 | 0 | 0 | 0 | 400 | 0 | 300 |
| 2016 | 0 | 0 | 0 | 0 | 0 | 400 | 100 | 300 |
| 2017 | 0 | 0 | 0 | 0 | 0 | 400 | 100 | 300 |
| 2018 | 0 | 0 | 0 | 0 | 0 | 400[4] | 100[4] | 300[4] |
| 2019 | 250 | 0 | 0 | 237[3] | 0 | 400[4] | 100[4] | 300[4] |
| 2020 | 250 | 0 | 0 | 237[3] | 0 | 400 | 100 | 300 |
| 2021 | 250 | 0 | 0 | 237[3] | 0 | 400 | 100 | 300 |
| 2022 | 250 | 0 | 1 143[2] | 0 | 805 | 400 | 100 | 300 |
| 2023 | 250 | 1 600 | 1 183[2] | 0 | 805 | 400 | 100 | 300 |
| 2024 | 250 | 1 600 | 283[2] | 0 | 0 | 800 | 100 | 300 |
| 2025 | 250 | 1 600 | 0 | 0 | 805 | 1 600 | 100 | 1 000 |
| 2026 | 1 000 | 1 600 | 0 | 0 | 0 | 400 | 0 | 500 |
| 2027 | 250 | 0 | 0 | 0 | 0 | 1 600 | 0 | 500 |
| 2028 | 1 000 | 1 600 | 0 | 474 | 690 | 0 | 0 | 500 |
| 2029 | 250 | 1 600 | 0 | 237 | 805 | 0 | 0 | 1 000 |
| 2030 | 1 000 | 0 | 0 | 948 | 0 | 0 | 0 | 1 000 |
| Total | 6 250 | 9 600 | 2 609 | 2 370 | 3 910 | 8 400 | 1 000 | 8 400 |



**Figure 2.2:** National Energy Development Commitments detailed in the IRP 2010

**Figure 2.2** above indicates the new capacities of the Policy commitment. The dates shown indicate the latest that the capacity is required in order to avoid security of supply concerns. The IRP notes that projects could be concluded earlier than indicated if feasible.

When promulgated in March 2011, it was indicated that the IRP should be a "living plan" which would be revised by the Department of Energy (DoE) every two years. Since the promulgation of the IRP 2010 there have been a number of developments in the energy sector in South and Southern Africa. In addition the electricity demand outlook has changed markedly from that expected in 2010. The DoE has now completed an IRP 2010 Update (which was available for comments until 7 February 2014). On 26 June 2014 the DoE formally released a request for registration ("RFR") to prospective independent power producers who anticipated submitting a bid response in the Coal Baseload IPP Procurement Programme. The Request for Proposal (RFP) was released by the DoE in December 2014 in terms of which coal baseload project are required to be bid by June 2015.

### *2.1.4 Electricity Regulation Act, 2006*

Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs). NERSA has recently awarded electricity generation licences for new generation capacity projects to renewable energy projects under the Renewable Energy IPP procurement (REIPPP) programme.

## 2.2 Provincial Policy and Planning Context

### *2.2.1. Mpumalanga Province Provincial Growth and Development Strategy*

The Mpumalanga Provincial Growth and Development Strategy (MPGDS) is a nine-year strategy (2004-2014) which aims to achieve the objectives of Vision 2014. As a provincial policy framework, it sets the tone and pace for shared growth and development in the Province. It addresses the key social, economic, environmental and spatial imperatives in the Province. The policy and strategy objectives of the PGDS are to:

» Give effect to the principles of a developmental state by facilitating cooperative governance and by prioritising development;
» Facilitate and support sustainable development through following an integrated approach to managing the relationship between socio-economic development and the environment;
» Actively promote and support economic growth and development in terms of the provincial economy, it's linkages to the national and international economy and with an emphasis on provincial priorities such as targeted growth areas, priority sectors and corridors as well as developmental priorities such as employment and eradicating poverty;
» Facilitate and provide essential services in social and human development in areas such as health, education, social welfare, community safety and with an emphasis on human capital development including human resources development and skills development; and
» Give special attention to transversal priorities including poverty eradication, also in targeted spatial areas and with an emphasis on areas such as gender equity, disability and youth. Transversal priorities also include the development of joint policy and planning capacities as well as monitoring and evaluation arrangements with an emphasis on capacity building.

The principles underpinning the MPGDS are informed by the notion of a developmental state. The key tasks of the developmental state are to achieve higher rates of growth and sustainable development to address social challenges such as poverty and inequality. The core elements of the developmental state include:

» The focus upon people and households, with the objectives of eradicating poverty and unemployment, ensuring equitable access to affordable benefits and ensuring that social infrastructure receives the same priority as physical infrastructure;
» The promotion of sustainable development by eliminating the gap between the first and second economies, while managing globalisation and developing social and institutional capacities;
» The initiation of selected interventions in the economy, not to focus on fast economic growth as an end in itself, but as a developmental strategy that generates sustainable growth directed towards the creation of jobs, the eradication of poverty, human and social development, yet without compromising environmental sustainability; and
» The use of co-operative governance and democratic participation, working within an environment of general consensus with open discussion of alternatives to assist in implementation, and the associated monitoring and evaluation process.

The implementation of the MPGDS is informed by the following vision, mission, and value statements.

» Vision: An improved quality of life for all the people of Mpumalanga;
» Mission: To promote viable economic growth and development, especially where it addresses job-creation and poverty reduction, in an environmentally sustainable manner within a spatial context and incorporating the principles of good governance.

The MPGDS states the importance of strengthening sustainable development through the following initiatives and interventions:

» Create an Environmental Hub to identify, develop and commercialise environmentally sustainable technologies and innovations such as green buildings, domestic renewable energy projects, recycling and resource efficiency, etc.);
» Quantify the value of ecosystem services and natural resources to the provincial economy;
» Improve environmental planning management and processes through the development Bioregional Plans for each District Municipality in response to the

updated State of the Province report and the Mpumalanga Biodiversity Conservation Assessment;
» Promote environmental education to ensure that the population knows the value of ecosystems;
» Improve land use management and planning through an integrated land use planning approach;
» Protect endangered biomes, especially grasslands threatened by new commercial developments;
» Address access to water, especially in areas where demand already exceeds supply and manage water demand;
» Improve demand-side resource efficiency with respect to the utilisation of water, electricity and all other resources for the benefit of all;
» Encourage recycling and reclamation as a revenue generation potential;
» Manage pollution including air quality, water quality and chemical seepage;
» Promote renewable energy technology use at the commercial, industrial and domestic level;
» Promote urban greening across all municipalities; and
» Support and encourage urban agriculture production to allow people to grow their own food (fresh vegetables, etc.).

The MPGDS states that key question to be addressed by the provincial government and all its social partners is, "How to ensure that Mpumalanga province remains globally competitive whilst still addressing issues of exclusion, inequality, marginalisation and moving towards a sustainable growth trajectory?"

The MPGDS further states that fundamental to answering the above question and improving the quality of lives of the people of Mpumalanga is building a *sustainable growth path that is people-centred and will contribute to eradicating poverty, supported by economic growth & development and social development in a sustainable manner.* The following seven priorities are put forward to achieve this:

» Use indigenous resources to create jobs;
» Support the industrial and service sectors to create jobs
» Reduce the impact of poverty through social services
» Enhance social cohesion and developing human capital
» Strengthen sustainable development
» Maximise the provincial benefits from the mining and energy sectors while mitigating any environmental impacts
» Improve governance and spatial integration

The priorities that are relevant to the proposed project include:

» Support the industrial and service sectors to create jobs;
» Enhance social cohesion and developing human capital;
» Strengthen sustainable development; and
» Maximise the provincial benefits from the mining and energy sectors while mitigating any environmental impacts

## 2.3 Local Policy and Planning Context

### 2.3.1 eMalahleni Municipality Integrated Development Plan

The vision for the ELM is "Striving together to be an excellent Centre for service delivery and development". The Missions Statement linked to the vision is "Providing affordable, accessible and sustainable quality service, enhancing community participation and creating a climate for economic development".

The IDP identifies a set of long term goals for the municipality aimed at increasing service delivery capacity, rehabilitating the current base at scale and growing the economic base. These are:

» The development of long term strategies for the municipality.
» Develop long-term financial strategy aligned with the operational and capital requirements over the next 3 to 5 years.
» Develop a capital investment programme and mobilising funding to revitalise the infrastructure base and ensure sufficient capacity to deliver services.
» Development of a partnership programme with the private sector and community to promote the development of the economic base.
» Execution of long term strategies.

The Key Performance Areas (KPAs) listed in the IDP relevant the proposed project include:

» Service Delivery and Infrastructure Development;
» Local Economic Development.

The development of Small Medium and Micro Enterprises (SMMEs) is also identified a key objective in the IDP. The IDP notes that in addition to the contribution of SMMEs to growth, SMME growth in South Africa has the potential of creating job opportunities, closing the income and wealth gap as well as dealing with the poverty challenge particularly among the previously disadvantaged population groupings. The proposed project should therefore investigate opportunities for involving SMMEs during the construction phase.

The IDP also identifies a number of constraints facing the SMME sector. Of relevance to the proposed project are:

» Lack of knowledge and skills;
» Electricity shedding (outages);
» Lack of training on tendering, pricing of documents and other finance matters as well as perceived corrupt practices discourage some SMMEs from tendering.

Local Economic Development (LED) and stakeholder engagement in terms of LED within the ELM is also identified as an area of concern. The challenges facing LED in the ELM include a non-existent or ineffective LED Forum (LEDF). As a result there has been a lack of effective participation by both the community and business in the activities of the LEDF.

The IDP concludes by noting that the Municipality is under immense pressure to lay the foundation for development by providing high capacity infrastructure to cater for the rapid growth and ensure that it provides skills to ensure that the available labour source caters for all employment levels.

## 2.4 Environmental Planning Context

### *2.4.1. Environmental Management Framework for the Olifants and Letaba River Catchment Areas*

An Environmental Management Framework for the Olifants and Letaba River Catchment Areas (OLEMF) was developed in 2009, the purpose of which is "to develop a framework that will integrate policies and frameworks, and align different government mandates in a way that will streamline decision-making to improve cooperative governance and guide future development in an environmentally responsible manner[4]". The OLEMF study area is indicated in Figure 2.3. The specific objectives of the EMF include:

» Encouraging sustainable development;
» Establishing development priorities;
» Identifying strategic guidance and development management proposals;
» Identifying the status quo, development pressures and trends in the area;
» Determining opportunities and constraints;
» Identifying geographical areas in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);

[4] Environmental Management Framework for the Olifants and Letaba River Catchment Areas

- » Specifying additional activities within identified geographical areas that will require EIA based on the environmental attributes of such areas;
- » Specifying currently listed activities that will be excluded from EIA within certain identified geographical areas based on the environmental attributes of such areas; and
- » Developing a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

Transalloys is situated in the Highveld Energy Hub Area (Zone A) according to the OLEMF, which describes this zone as representing the current "powerhouse" of South Africa, housing extensive coal fields, numerous large coal mines, 7 coal-fired power stations and several major industries and towns that are located in the area. The OLEMF further describes Zone A as the area where the sensitive headwaters of the Olifants River catchment occur where water quality impacts that originate in the areas have significant implications for downstream areas. The natural vegetation of the area has been almost completely destroyed and the remaining pans and wetlands are important refuges for natural life.

The proposed power station would be viewed as a preferred development within this Zone as it is directly associated with mining (i.e. the Anglo Coal Landau Colliery) and energy generation.

According to the EMF, Transalloys is situated within areas described as:

- » Population density: 0-60 people per km²
- » Mean Annual Precipitation: 600 – 800mm
- » Geological systems: Karoo Sequence
- » Predominantly arenaceous rocks (sandstone, shale and grit)
- » Morphological description: Highveld, undulating plains
- » Soil description: Plinthic catena
- » Land capability for arable agriculture: highly suitable arable land
- » Olifants River Subcatchment
- » Tertiary Catchment: B11
- » Vegetation: Mesic Highveld Grassland
- » Situated within an Endangered ecosystem
- » No natural areas remaining in terms of the Mpumalanga Biodiversity Conservation Plan (MBCP)
- » Protected areas: None located on site. A National Protected Areas Expansion Strategy (NPAES) area is situated within 10km north of the site.
- » Transalloys is situated on the fringe of a temperature inversion risk area characterised by conditions which are highly adverse for the dispersion of atmospheric pollutants, namely high atmospheric stability, clear skies and low wind speeds.


**Figure 2.3:** The EMF study area (Source: OLEMF)

### *2.4.2. Highveld Priority Area*

The National Environmental Management: Air Quality Act 39 of 2004 (AQA) requires Municipalities to introduce Air Quality Management Plans (AQMP) that set out what will be done to achieve the prescribed air quality standards. Municipalities are required to include an AQMP as part of their Integrated Development Plan.

Air quality legislation comprises primary standards which protect human health and secondary standards which protect property, vegetation, climate and aesthetic values. The development of new industries that increase air pollution through the emission of gases in the atmosphere should be managed and require that polluting industries comply with air quality standards.

Transalloys is located near eMalahleni in the Mpumalanga Province and falls within the Highveld Priority Area (HPA) airshed (refer to Figure 2.4). The Highveld area is associated with poor air quality and elevated concentrations of criteria pollutants which occur due to the concentration of industrial and non-industrial sources (Held et al, 1996; DEAT, 2006). Power Generation activity in the HPA is the major source of $SO_2$ emissions (82%) and $NO_x$ emissions (73%) while it is only responsible for a relatively small contribution to the total $PM_{10}$ load (12%). The power generation activity of the proposed Transalloys power plant will potentially contribute further to the existing air pollution load which is already in exceedance of the South African National Ambient Air Quality Standards (NAAQS) for pollutants such as $SO_2$ and $PM_{10}$ within the eMalahleni (Witbank) hotspot area.

The Minister of Environmental Affairs and Tourism (Martinus van Schalkwyk at the time) therefore declared the HPA on 23 November 2007. The priority area covers 31 106 km, including parts of Gauteng and Mpumalanga Provinces, with a single metropolitan municipality, three district municipalities, and nine local municipalities. As the area overlaps provincial boundaries, the Department of Environmental Affairs (DEA) functions as the lead agent in the management of the priority area and is required in terms of Section 19(1) of the NEM:AQA to develop an Air Quality Management Plan (AQMP) for the priority area.

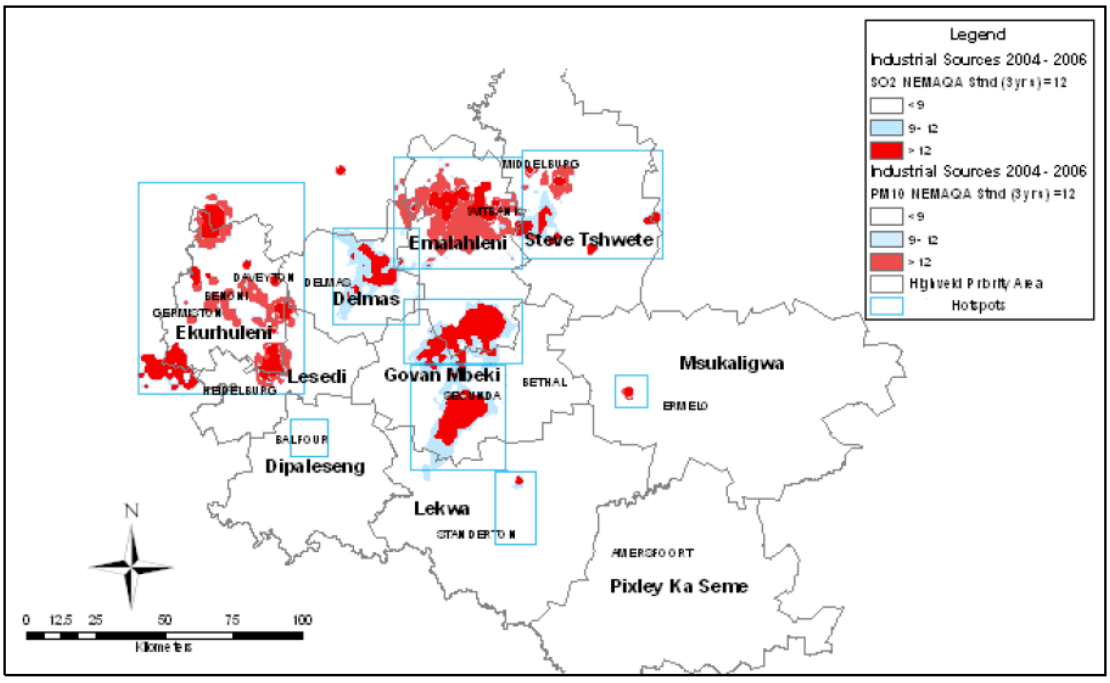



**Figure 2.4**: Extent of Highveld priority area indicating hotspot areas of $PM_{10}$ and $SO_2$ exceedance (Zunckel, Naiker et al. 2010)

The DEA published the management plan for the HPA in September 2011. Included in this management plan are 7 goals, each of which has a further list of objectives that has to be met. The 7 goals for the Highveld Priority area are as follows:

- **Goal 1:** By 2015, organisational capacity in government is optimised to efficiently and effectively maintain, monitor and enforce compliance with ambient air quality standards.
- **Goal 2:** By 2020, industrial emissions are equitably reduced to achieve compliance with ambient air quality standards and dustfall limit values.
- **Goal 3:** By 2020, air quality in all low-income settlements is in full compliance with ambient air quality standards.
- **Goal 4:** By 2020, all vehicles comply with the requirements of the National Vehicle Emission Strategy.
- **Goal 5:** By 2020, a measurable increase in awareness and knowledge of air quality exists.
- **Goal 6:** By 2020, biomass burning and agricultural emissions will be 30% less than current.
- **Goal 7:** By 2020, emissions from waste management are 40% less than current.

Due to the proposed Transalloys power station falling within the HPA, it will contribute to the pollution within the Highveld airshed. It is recommended that the management plan for the HPA be included in all management plans proposed for the project.

## 2.5 International Standards

### *2.5.1 Equator Principles*

The Equator Principles is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The Principles include:

- Principle 1: Review and Categorisation
- Principle 2: Environmental and Social Assessment
- Principle 3: Applicable Environmental and Social Standards
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan
- Principle 5: Stakeholder Engagement
- Principle 6: Grievance Mechanism
- Principle 7: Independent Review
- Principle 8: Covenants
- Principle 9: Independent Monitoring and Reporting

» Principle 10: Reporting and Transparency

Should funding for the project by Equator Principles Financial Institutions (EPFIs) be required, the EPs will need to be complied with, whereupon, the following documentation will need to be considered:

» The Equator Principles (June 2013)
» International Finance Corporations Performance Standards, 2012
» International Finance Corporations General Environment, Health and Safety

### *2.5.2 IFC Performance Standards*

The Equator Principles' Social and Environmental Rating Framework integrally derives from the International Finance Corporation (IFC) Performance Standards which were developed to manage social and environmental risks and impacts and to enhance development opportunities. Together, they establish standards that the client is to meet throughout the life of an investment.

IFC Performance Standards (January 2012) are as follows:

» Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
» Performance Standard 2: Labour and Working Conditions
» Performance Standard 3: Resource Efficiency and Pollution Prevention
» Performance Standard 4: Community Health, Safety, and Security
» Performance Standard 5: Land Acquisition and Involuntary Resettlement
» Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
» Performance Standard 7: Indigenous Peoples
» Performance Standard 8: Cultural Heritage

The IFC published General Environmental, Health and Safety Guidelines, which contain information on environmental, health, and safety issues potentially applicable to all industry sectors. An industry specific **Environmental Health and Safety Guidelines for Thermal Power Plants** (including coal-fired power stations) was developed as a technical reference document providing industry-specific examples of Good International Industry Practice (GIIP)[5]. The guideline contains a detailed description of industry activities, impacts and risks for this

[5] Defined as the exercise of professional skill, diligence, prudence and foresight that would be reasonably expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility.

sector, as well as guidance for Environmental Assessment of thermal power projects (Annexure B) of which this EIA Report takes full cognizance.

Environmental issues in thermal power plant projects during operations primarily include air emissions, Greenhouse Gas emissions, water consumption and aquatic habitat alteration, effluent discharge, solid wastes, hazardous materials and oil and noise. In addition, health and safety impacts are of particular concern during operation of thermal power plants due to risks relating to non-ionizing radiation, heat, noise, confined spaces, electrical hazards, fire and explosion hazards, chemical hazards and dust.

# SCOPE AND DESCRIPTION OF THE PROPOSED PROJECT CHAPTER 3

The Transalloys power station components and infrastructure presented in this chapter are indicative at this stage and aimed at enabling the reader to obtain an understanding of the proposed project.

## 3.1. Need and Desirability for the Proposed Transalloys Coal-Fired Power Station

Transalloys commissioned a high level desktop investigation in 2013 to inform the technical and bankable feasibility of the proposed power plant project. The study concluded that several key advantages exist which directly inform the need and desirability of the project, the primary advantages being:

» Proximity to the coal resource (discard or waste coal) for use in the firing process which could in turn lead to a reduction of coal discard dumps in the area and associated positive impacts (for the 150 MW option);
» Raw water surplus from mines and other industrial sources in the area;
» The availability of suitable boiler technology for improved emissions results within the context of air quality challenges within the Highveld Priority Area;
» Direct connection to the existing electricity infrastructure (Transalloys substation and associated power lines), the existence of which will result in significant cost advantages.

The production capacity of the Transalloys smelter complex is 180,000 tons of Silicomanganese per annum, produced by 5 submerged arc furnaces of between 18 MVA and 48 MVA, with a total electrical power demand of 137 MVA. Transalloys, therefore, is considered an energy intensive user with recent above-inflation electricity tariff increases significantly affecting the company's profitability.

Unreliable national energy supply is affecting the company's productivity. Furthermore Transalloys has established that should the proposed power station not be constructed, at which point they will become less reliant on the Eskom grid, that the business will suffer significant financial losses, having downstream impact on shareholder profits and viability of the business, leading to job losses and even closure.

Transalloys therefore intends to develop a captive power plant for "own generation" to accommodate their total current demand and potential future expansion requirements. To this end a power plant of between 55MW and 150 MW is proposed to be constructed.

The desirability of the power plant from Transalloys' perspective centres mainly around issues of profitability and business sustainability. However, it can be reasoned that should the project be successful, that self-generation (or partial self-generation) would result in a substantial reduction in pressure on the Eskom grid.

The construction and operation of a power-plant at Transalloys is considered to be technically feasible due to the industrial and mining land use context and the availability of coal and water resources for the operation of the power station.

Following detailed technical investigations conducted for the 150 MW power station during the preparation of this EIA report, and consideration of the associated cost and potential environmental impacts associated with its development, Transalloys made a decision to further investigate the feasibility of a smaller 55MW power station as an alternative to the 150 MW power station.

## 3.2. Summary of the Proposed Project Components

The project involves the construction of a captive coal-fired power station and associated infrastructure with a generating capacity of between 55MW and 150 MW.

The smaller 55MW plant will consist of a decommissioned power plant, currently situated in Austria, Europe. The plant is proposed to be dismantled, refurbished and shipped to South Africa, whereupon the dismantled components will be erected on site and the necessary services installed. The re-design of components will be undertaken where necessary in order to ensure successful relocation. The service provider will also undertake the commissioning and eventual handover of the power plant to Transalloys. A residual life expectancy of 30 years is estimated for the 55MW plant at its new proposed location with continued maintenance. The power plant will be equipped with a gas cleaning facility in order to meet local emissions standards.

Table 3.1 below summarises the details/components of the proposed project for both the 150 MW and 5 0MW alternatives, including the main infrastructure and services. The listed activities triggered in terms of NEMA and the Waste Act are indicated in the footnotes. Refer also to the detailed descriptions in this Chapter and the preliminary layout included in Appendix A.

**Table 3.1:** Description of components of the proposed Transalloys Power Plant for both the 150 MW and 55MW alternatives

| Component | Description – 150 MW Plant | Description – 55MW Plant |
|---|---|---|
| Location of the site | Transalloys Siliconmanganese smelter complex - Portions 20 and 24 of the Farm Schoongezicht 308 JS | Transalloys Siliconmanganese smelter complex - Portions 20 and 24 of the Farm Schoongezicht 308 JS. The existing plant is currently situated in Austria. |
| Municipal Jurisdiction | The site is located within the eMalahleni Local Municipality which falls within the Nkangala District Municipality. | The site is located within the eMalahleni Local Municipality which falls within the Nkangala District Municipality. |
| Power Plant | » 150 MW capacity[6]<br>» Annual average capacity factor of ~85%<br>» Operational 24 hours per day, 365 days pa<br>» Life of plant: ~25 years | » 50 MW capacity<br>» Annual average capacity factor of ~40%<br>» Operational availability 24 hours per day/365 days pa Life expectation: ~25 years |
| Stack height | Recommended height: 150m | Maximum: 65 m |
| Proposed technology | » Circulating Fluidised Bed (CFB) coal-fired power station<br>» Dry cooled | » Pulverized coal fired power station<br>» Dry cooled |
| Extent of the proposed development footprint | » Power Plant – 30 ha<br>» Ash Disposal Facility – 30 ha<br>» Evaporation pond – 8 ha | » Power Plant – ~ 10 ha<br>» Ash Disposal Facility – ~ 10 ha<br>» Evaporation pond – ~ 3 ha |
| Extent of broader site | » Site of proposed power plant: 38 ha<br>» Site of Ash disposal facility: 38 ha<br>» Total: 76 ha[7] | » Site of proposed power plant, ash disposal facility and evaporation pond: 38 ha |
| Construction period | ~42 months | ~ 18 months |
| Site access | The R547 Road is expected to be the main access road to the project site. Existing gravel access roads will be utilised in order to access the power plant. The gravel roads will be widened to be 8m in width. | The R547 Road is expected to be the main access road to the project site. Existing gravel access roads will be utilised in order to access the power plant. The gravel roads will be widened to be 8m in width. |

[6] Triggers Listed Activity 1 of GN R 545

[7] Triggers Listed Activity 15 of GN R 545

| Component | Description – 150 MW Plant | Description – 55MW Plant |
|---|---|---|
| Material characteristics and flow rates (coal, limestone and ash) assuming 85% capacity factor | Coal:<br>» 788 000 tons per year of coal with a 14.1 MJ/kg calorific value required.<br>» Average coal density is based on 960 kg/$m^3$.<br>» Moisture content 12%.<br>» Plant is estimated to receive 79 coal trucks per day (based on 32 ton capacity trucks and unit at 100% capacity)<br><br>Limestone:<br>» ~ 123 000 tons per year of limestone required<br>» Average limestone - 1360 kg/$m^3$.<br>» Plant is estimated to receive 13 limestone trucks per day (based on 32 ton capacity trucks)<br>» Footprint - ~ 2700 $m^2$.<br><br>Ash:<br>» ~ 410 000 tons per annum of ash based on 40% ash coal generated.<br>» ~ 46 ash haul trucks per day (32 ton capacity) between power plant and Ash Disposal Facility (~ 1 km each way) | Coal:<br>» 165 000 tons per year of coal with a > 25 MJ/kg calorific value required.<br><br>» Moisture content < 12%.<br>» Plant is estimated to receive 20 coal trucks per day (based on 32 ton capacity trucks and unit at 100% capacity)<br><br>Limestone:<br>~ 2 000 tons per year of limestone required<br>required<br><br>» Plant is estimated to receive 1 limestone trucks per week (based on 32 ton capacity trucks)<br>» Footprint – ~200 $m^2$.<br><br>Ash:<br>» ~ 70 000 tons per annum of ash based on < 12% ash coal generated.<br>» ~ 6 ash haul trucks per day (32 ton capacity) between power plant and Ash Disposal Facility (~ 1 km each way) |
| Coal storage areas and bunkers, Coal loading and offloading areas | » Coal is to be provided to the power station from various sources around eMalahleni and Middleburg.<br>» Coal will be transported to the coal storage area in trucks with capacity of 32 metric tons.<br>» Coal stockyard - 2 piles sized for 51 000 tons or ~21-days storage[8]. | » Coal is supposed to be provided to the power station from various sources around eMalahleni and Middleburg.<br>» Coal will be transported to the coal storage area in trucks with capacity of 32 metric tons.<br>» Coal stockyard – assumption 2 piles sized |

[8] Triggers Listed Activity 2 of GN R 544

| Component | Description – 150 MW Plant | Description – 55MW Plant |
|---|---|---|
| | » Footprint – 6 000 $m^2$<br>» Height – 13m | for 15 000 tons or ~21-days storage.<br>» Footprint – approx. 2 000 $m^2$<br>» Height – 10m |
| Sorbent (limestone granular) storage | » To be stored in open storage pile sized for 31 000 tons or ~30 days capacity.<br>» Footprint - 2700 $m^2$<br>» Limestone will be transported to an open storage pile in trucks with capacity of 32 metric tons. | » To be stored in open storage pile sized for 200 tons/30 days.<br>» Footprint – approx. 500 $m^2$<br>» Limestone will be transported to an open storage pile in trucks with capacity of 32 metric tons. |
| Ash disposal facility and associated drainage channels and pollution control dams | » 25 years storage capacity; 312 000 $m^3$/a based on 85% CF and 40% ash coal<br>» Sized for 8 million $m^3$<br>» ~35ha in extent<br>» Height: ~50m<br>» Approximately 46 ash haul trucks per day (32 ton capacity) between power plant and Ash Disposal Facility (approx. 1 km each way)<br>» 2 X 50% pollution control dams to be associated with ash dam – capacity of each proposed to be ~230 000$m^3$ | » 25 years storage capacity; 70 000 to/a based on 85% CF and <12% ash coal<br>» ~10ha in extent<br>» Height: ~50m<br>» Approx. 6 ash haul trucks per day (32 ton capacity) between power plant and Ash Disposal Facility (approx. 1 km each way) |
| Grid connection | » On-site 132kV substation (HV Yard) associated with the power station<br>» 132kV power line connecting the power station to the Transalloys Substation[9]. | » 33kV power line connecting the power station to the Transalloys Substation |
| Services required | » Refuse material disposal – During construction and operations, all refuse material generated from the proposed development will be collected by a contractor to be disposed of at | Same as 150MW plant |

[9] Triggers Listed Activity 10 (i) of GN R 545

| Component | Description – 150 MW Plant | Description – 55MW Plant |
|---|---|---|
| | a licensed waste disposal site off site. This service will be arranged with the municipality when required.<br>» Sanitation – during construction, all sewage waste will be collected by a contractor to be disposed of at a licensed waste disposal site. This service will be arranged with the municipality when required. During operation, a sewage treatment facility will be operated on the site.<br>» Water – 420 $m^3$/day of raw water is required. Water is proposed to be supplied from the neighbouring EVRAZ Highveld Steel plant via a water supply pipeline. | |
| Pipeline for raw water supply[10] | » Length:~2km in length from EVRAZ Highveld Steel plant to the Raw Water Storage Reservoir on site<br>» Landowners along the pipeline route: EVRAZ Highveld Steel and Transalloys | » Length:~2km in length from EVRAZ Highveld Steel plant to the Raw Water Storage Reservoir on site<br>» Landowners along the pipeline route: EVRAZ Highveld Steel and Transalloys |
| Raw-Water Storage Reservoir and Pump-station | » Capacity: 1 260$m^3$ (3 day supply)<br>» Material: Above grade steel tank | » Capacity: (3 day supply)<br>» Material: Above grade steel tank |
| Water treatment plant[11] | » Raw water pre-treatment ~420 $m^3$/day average.<br>» Demineralized water treatment ~260 $m^3$/day average. | » Raw water pre-treatment not applicable<br>» Demineralized water treatment ~40 $m^3$/day average. |
| Wastewater treatment plant | » Sanitary wastewater daily throughput capacity: ~31 $m^3$/day | » Sanitary wastewater daily throughput capacity: ~10 $m^3$/day |

[10] The diameter and throughput of the water pipeline does not trigger Activity 9 of GN R 544

[11] The throughput capacity of the water and wastewater treatment plants are below thresholds specified by Activity 55A of GN R 544

| Component | Description – 150 MW Plant | Description – 55MW Plant |
|---|---|---|
| | » Chemical wastewater daily throughput capacity: ~9.8 $m^3$/day<br>» Potential-oily wastewater at 190 $m^3$/day average. | » Chemical wastewater daily throughput capacity: ~3,5 $m^3$/day<br>» Potential-oily wastewater at 70 $m^3$/day average. |

**This EIA report considers the worst-case scenario of a 150 MW power station (in terms of environmental impacts) as well as the 55 MW power station and its associated reduction in footprint and environmental impacts.**

A preliminary perspective view of the proposed power station (150 MW worst case scenario) relative to other existing / proposed developments and settlements is provided in Figure 3.1. The main components of the power station are shown on the preliminary facility layout contained within Appendix A.

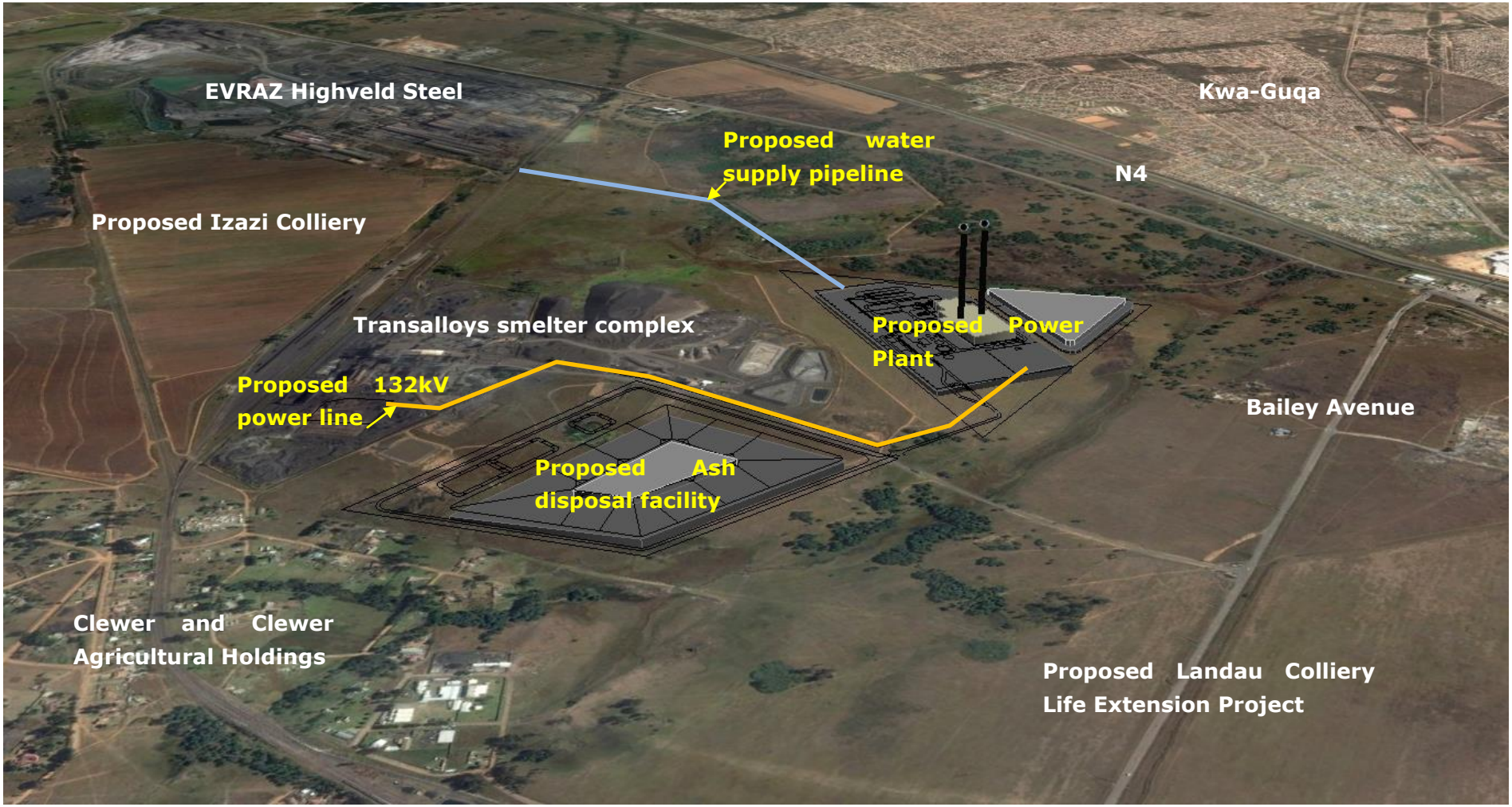



**Figure 3.1:** Perspective view indicating the location of the proposed Transalloys Power Station (150 MW alternative only) and associated infrastructure in relation to other mining, industrial and residential activities within the area (visual simulation courtesy of MetroGIS). Note that the entire footprint of the 55MW plant and associated infrastructure can be accommodated within the area shown as "proposed power plant".

## 3.3. Process Description

This section of the report provides a description of the energy generation process from the point of material (coal and limestone supply), materials handling, workings of the power plant, water used in the process, ash management system and waste management and treatment for both the 55MW and 150 MW power plant alternatives. A process flow diagram is provided as Figure 3.2 and illustrates the flow of inputs and outputs associated with the energy generation process.

### *3.3.1 Coal Supply*

Coal from existing nearby coal mines will be burned in the CFB boiler. The coal characteristics will vary significantly based on the source and quality of discards in the existing coal dumps and the size of the plant (50 MW or 150 MW). Various potential coal supply sources have been identified by Transalloys, including sources from as close as the neighbouring Landau Colliery to sources in Middleburg. The final coal supply source will be determined based on commercial considerations (including quality, cost of coal and transportation costs), at which time contracts to secure the coal will be finalised. Coal will be delivered to the site in trucks (refer to Table 3.1 for specifications).

### *3.3.2 Coal Handling*

Coal will be received by side tip trucks with a capacity of 32 metric tons. Coal will be stored in two separate open storage stockpiles to provide mixing capability. The total storage capacity will be 21 days for both stockpiles combined.

A coal hopper will be used to receive coal from trucks. The trucks may dump coal directly to the hoppers or directly to the storage piles if the hoppers are full. Mobile equipment such as wheel loaders or dozers will be used to move coal from the storage piles to the hoppers. Two separate storage piles and two reclaim hoppers provide mixing capability if it is necessary to mix coals of differing quality such as from two suppliers. The coal mixing will be achieved as it is reclaimed simultaneously from both reclaim hoppers with variable speed belt feeders at the hopper outlets controlling the feed rates for the target mixing ratio.

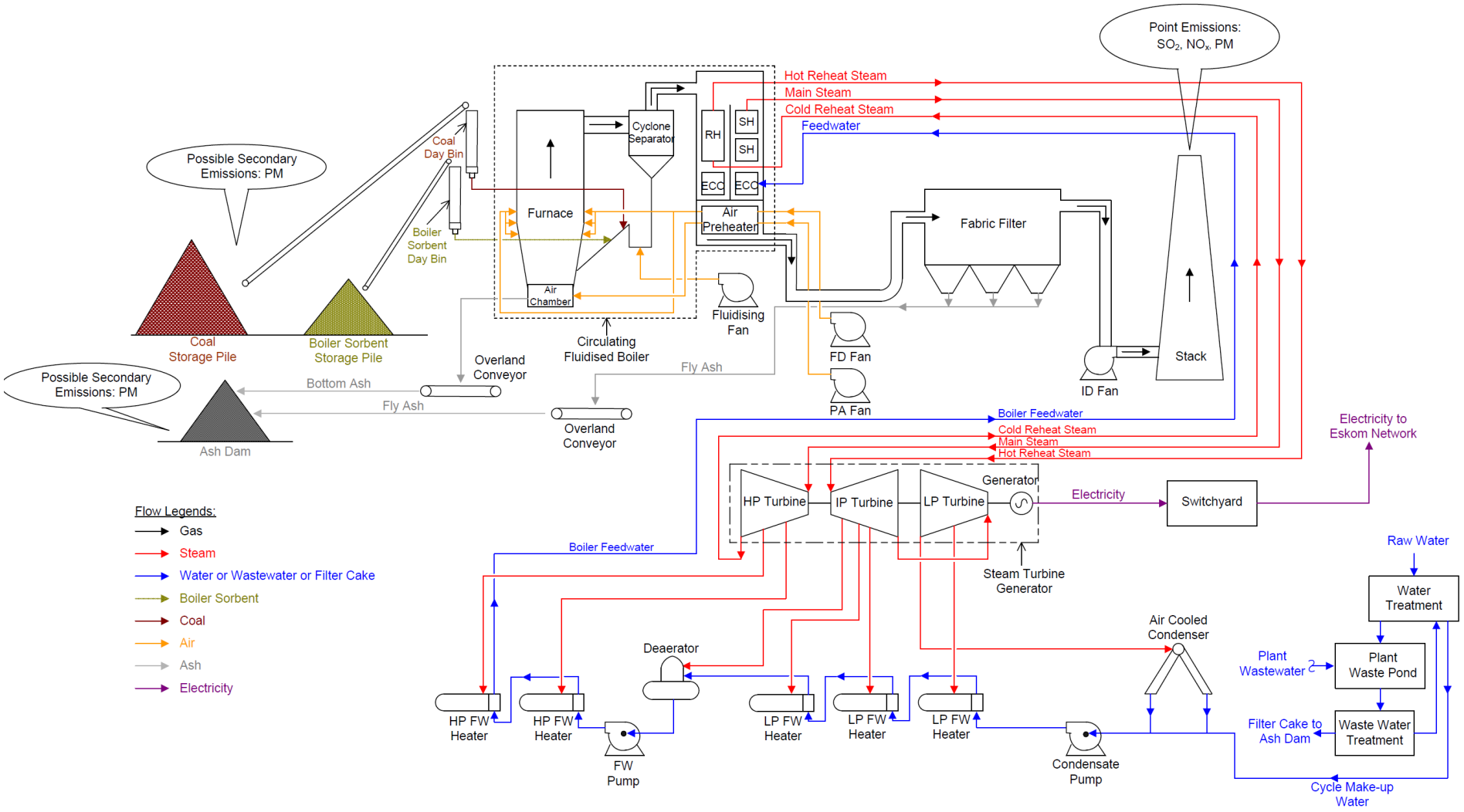



**Figure 3.2:** Process flow diagram (Black and Veatch)

Coal primary crushers will be located at the underground hopper outlet after the belt feeders. The first coal reclaim conveyor will transfer the coal from the primary crushers to the second coal reclaim conveyor at the transfer point located in the transfer tower. The second reclaim conveyor will transfer the coal to a surge bin located in the crusher house which feeds a secondary coal crusher. The plant feed conveyor will transfer the coal to the coal silos via reversible feed conveyors.

### *3.3.3 Sorbent (Limestone)*

To conform to South Africa's standards for sulphur dioxide ($SO_2$) emissions of 500 mg/$Nm^3$ at 10% $O_2$, the Power Plant will require in-bed sorbent injection. Limestone will be used as the sorbent for the Power Plant. Approximately 123 000 tons of limestone per year (or 13 trucks per day) or 2 000 tons of limestone (1 truck per week) will be required for the 150 MW and 55MW power plant respectively. Limestone will be sourced from nearby commercially available sources.

Limestone will be received by side tip trucks with a capacity of thirty-two (32) metric tons. Limestone will be stored in an open storage pile, with a storage capacity of about thirty (30) days. An underground limestone hopper will receive the limestone from trucks. The trucks may dump limestone directly to the hoppers or directly to the storage pile if the hopper is full. Mobile equipment such as wheel loaders or dozers will be used to move limestone from the storage pile to the reclaim hopper. A limestone crusher will be located after the belt feeder at the underground hopper outlet. The first limestone reclaim conveyor will transfer the limestone from the crusher to the second limestone reclaim conveyor via a transfer point located in the transfer tower. The second limestone reclaim conveyor will transfer the limestone to the plant feed conveyor using the coal crusher house for the transfer between the conveyors. The limestone feed conveyor will feed the limestone to the limestone silo.

The coal and limestone handling processes are illustrated in Figure 3.3.

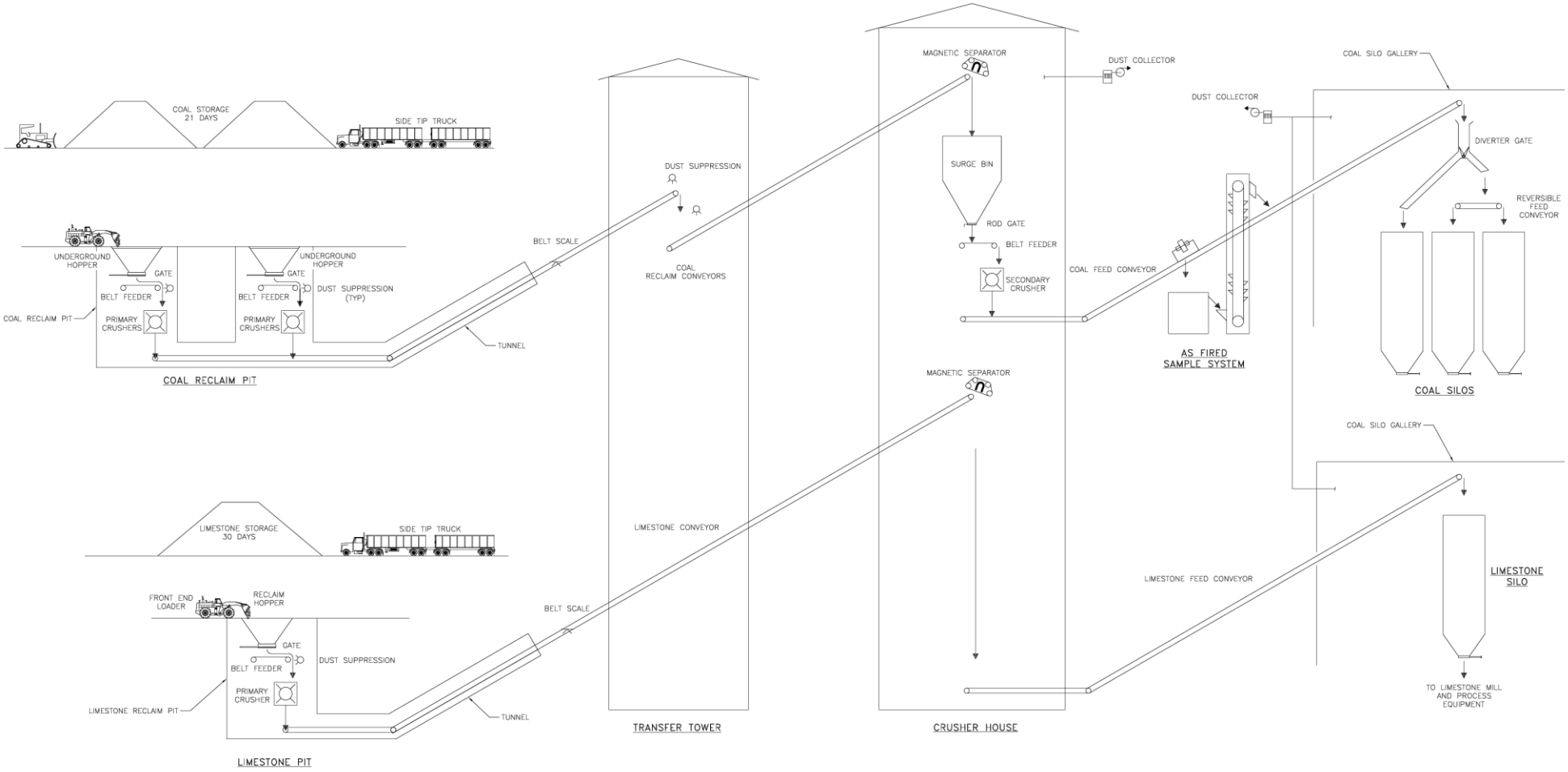



**Figure 3.3:** Coal and limestone handling flow diagram based on the 150 MW plant alternative (Black & Veatch)

### *3.3.4 Power plant*

The Power Plant will consist of a single reheat circulating fluidised bed (CFB) boiler. A more detailed description of CFB technology is included in Section 3.4 below. Balanced draft within the boilers will be maintained by one full capacity induced draft fan per unit. South African $SO_2$ emissions limits will be achieved through combustion processes by directly injecting sorbent into the boiler's combustion chamber. Nitrogen oxide ($NO_x$) emissions limits will be controlled through regulating combustion temperature by varying combustion air supplied by one full capacity primary air fan and one full capacity secondary air fan. A pulse jet fabric filter (PJFF) system will control particulate emissions. A reinforced concrete chimney will be equipped with a continuous emissions monitoring system (CEMS) to monitor the plant's flue gas quality on a continuous basis.

The unit will consist of a 3 000 revolutions per minute (rpm) condensing steam turbine with air cooled condenser. The turbine will drive an air cooled generator which will produce 150 MW at the generator output terminals. Power generated by the turbine generator will be stepped up to 132 kV by a three-phase generator step-up transformer. Power would then be connected to the Transalloys 132 kV switchyard. Power from the switchyard will subsequently be connected to Eskom's 132 kV system.

Table 3.2 below outlines the design basis for the plant. Site arrangements for the plant are illustrated in Figure 3.4.

**Table 3.2:** Design basis for the Transalloys power plant (based on 150 MW plant)

| | **Design Basis** |
|---|---|
| Gross Plant Output, MW | 150 |
| Auxiliary Load, MW | 16.5 |
| Net Plant Output, MW | 133.5 |
| Boiler Efficiency (HHV Basis), percent | 85.45 |
| Net Plant Heat Rate (HHV Basis), kJ/kWh | 11,171 |
| Net Plant Thermal Efficiency (HHV Basis), percent | 32.23 |
| Fuel Burn Rate, tons per hour | 105.8 |
| Capacity Factor (5) | 85 |
| Plant Raw Water Requirement, $m^3$/day (annual average) | 420 |
| Bed Ash Production, tons/hr | 27.6 |
| Fly Ash Production, tons/hr | 27.6 |
| Sorbent Consumption, tons/hr | 16.6 |

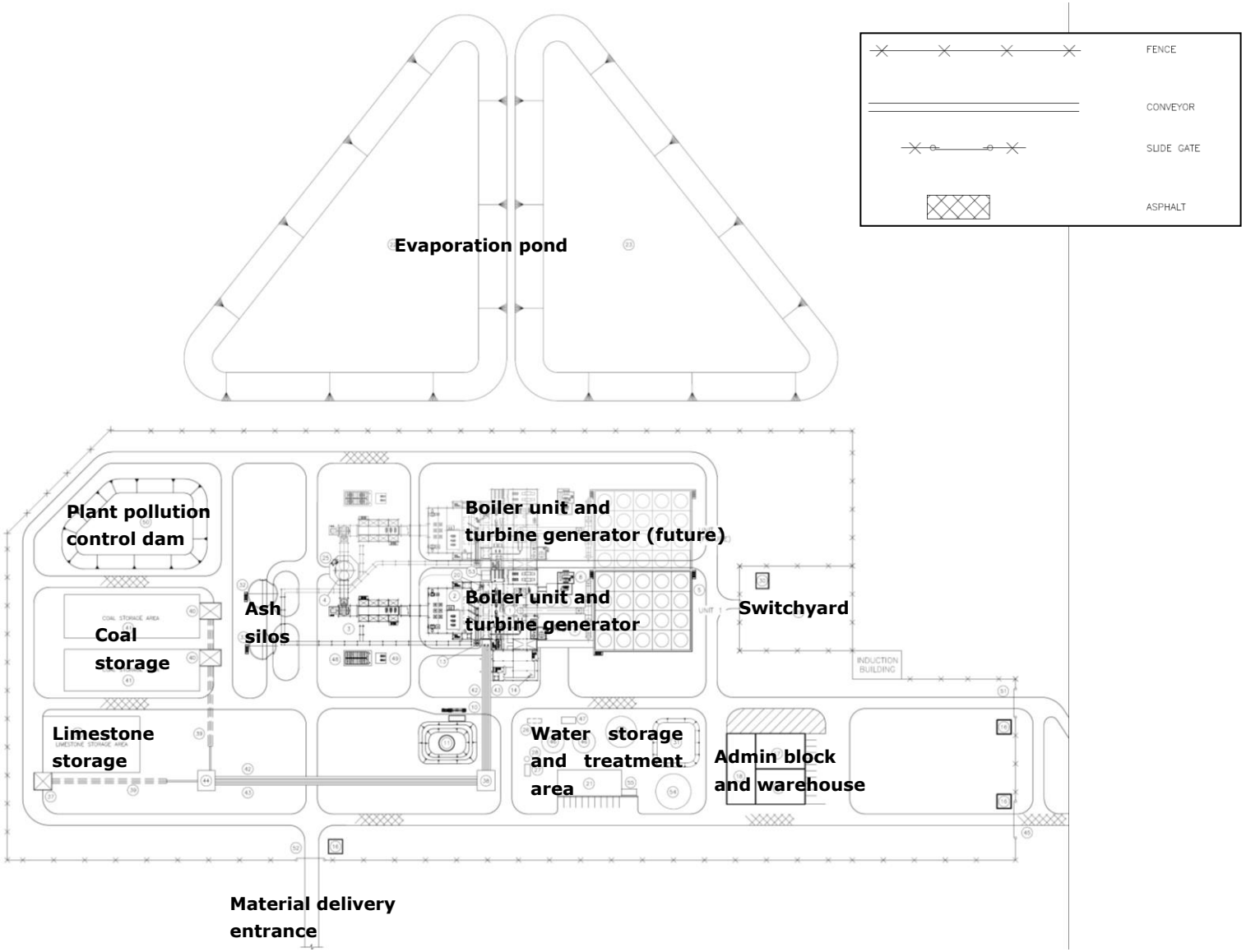



**Figure 3.4**: Site arrangements of the proposed Transalloys power plant and evaporation ponds (150 MW plant alternative) indicating some of the main components (Black & Veatch). Refer to Appendix A for detailed A3 layout

### *3.3.5 Water Use*

The power plant will use water of different qualities in the following specific areas or processes:

» Dry cooling will be used for condensing steam exhausted from the turbines. The cycle heat rejection will be undertaken through use of heat exchangers that transfer the heat directly to the ambient air. No water will thus be required for this purpose.
» The steam cycle will utilise demineralised water in a closed circuit. Some make-up water will be required as the result of small losses due to leakage and blow-downs. Make-up demineralised water will be produced by treating raw water using the ion exchange method.
» Service water will be required for general cleaning of the plant, fire protection, and other miscellaneous plant uses.
» Plant wastewater will be treated as required for utilization in the bottom ash system, ash conditioning and landfill process and the coal dust suppression systems.
» Treated sewage plant effluent is proposed to be used for irrigation of the ash landfill for dust suppression and for regeneration of plant life as cells are covered with soil and grass.
» Potable water for domestic purposes at the power station will be obtained by treatment of raw water.

Raw water for power cycle makeup, fire water, potable water, service water, and other plant uses shall be provided from a new common pipeline, to be installed and connected to a connection to be provided at the EVRAZ Highveld Steel plant, located approximately 2 km from the project site. The proposed alignment of the pipeline is indicated in Figure 3.1. Various alternative pipeline routes have been considered based on the water supply sources considered for this project and are discussed in Chapter 4.

The power plant, although equipped with a dry cooling system, will require approximately 420$m^3$ per day of raw water under average annual rainfall conditions for the 150 MW plant and 40$m^3$ per day for the 55MW plant. Water will be piped to the site and stored in a raw water storage tank. Two demineralisation water trains (plants) will treat water from the tank for subsequent storage in a demineralised water storage tank. High quality demineralised water from the demineralised water storage tank will be sent to the power generation unit for cycle makeup water.

The unit's feed water heating cycle design will include three low pressure (LP) feed water heaters, a de-aerating feed water heater, and two high pressure (HP)

feed water heaters for a six feed water heater cycle. Main cycle heat rejection will be accomplished with an air-cooled condenser, while auxiliary cooling will utilize fin-fan coolers.

The Power Plant will be a zero liquid discharge (ZLD) facility utilizing a holding recycle dam to re-use waste water to minimize the facility's water consumption and an evaporation pond to eliminate wastewater discharge (illustrated in Figure 3.4). Bed ash and fly ash, produced as a result of combustion, will be pneumatically conveyed to ash storage silos and subsequently wetted (utilising wastewater) to minimise dust generation and conveyed to the ash disposal facility.

### *3.3.6 Ash Management System*

An ash management system is required for the Power Plant ash. The ash disposal facility is sized to accommodate the estimated bottom ash and fly ash from the plant for 25 years assuming a conservative availability and capacity factor. For the 150 MW plant, the ash disposal facility provides storage for a volume of approximately 8 million cubic meters of ash and would have a footprint of approximately 35ha in extent and will be approximately 50m high. The 55MW plant provides for a volume of approximately 1.8 million cubic meters of ash and would have a footprint of approximately 10ha in extent and will be approximately 50m high. The ash disposal facility will be designed according to the requirements for waste disposal as contained in Regulation 636 of August 2013 published in terms of the NEM: Waste Act (Act No 59 of 2008).

**Ash Transport system:** Trucks will be used to transport ash from the power station to the ash disposal facility site over a distance of less than 1km. The dry ash will be conditioned by the addition of wastewater of a required standard at the power station to ensure dust generation is minimised. The trucks will be loaded at the ash silos and will transport the ash to the ash disposal facility. The trucks will unload the ash to the active component of the ash storage facility.

**Ash Disposal Facility:** The ash disposal facility is essentially a landfill where the ash generated by the power plant will be deposited (Figure 3.5). It will be a lined disposal facility to minimise pollution risks to the environment. The liner or barrier design will be governed by the waste classification of the ash material by means of the Department of Environmental Affairs waste classification regulations for the disposal of waste and the regulations governing the design of waste disposal facilities. The ash stack will be sized to accommodate the ash generated over the life of the 25 year life of the power plant. The height of the ash stack will be approximately 50 m.

The ash disposal facility will be formed by ash haul trucks loading ash from the ash silos, driving up haul roads on the facility to its plateau and dumping the ash, with a bulldozer performing final shaping activities.

Phasing of the ash disposal facility into cells that will rise to full height means that concurrent rehabilitation can commence relatively early in the life of the facility. As the earthworks for a new cell is completed, the topsoil and spoil from development of the new cell will be placed on top of the previous cells, reducing handling costs and the need to form intermediate stockpiles. The topsoil will be of suitable quality to support vegetation growth.

A sufficiently high berm will be constructed around the ash disposal facility and a suitable drainage channel will be constructed inside the berm for surface runoff water control. The ash disposal facility will have a membrane liner and a run-off collection system. Run-off and leachate collection ponds of suitable size will be constructed around the ash disposal facility. Perimeter stormwater canals will be designed to collect dirty water runoff from the ash disposal facility surface and will be discharged to pollution control dams (two planned). The canals will be sized to accommodate runoff from a 50 year 24 hour rainfall event. Canals will be appropriately lined to prevent seepage. Treated effluent from the wastewater treatment plant will be used at the ash disposal facility for dust suppression.

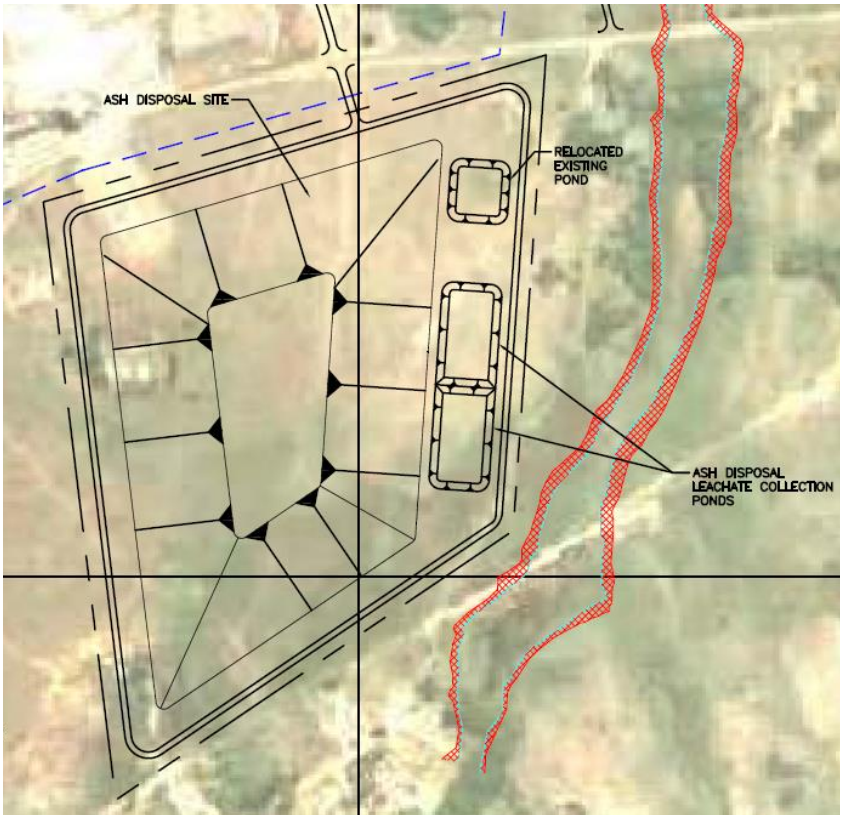



**Figure 3.5:** Site arrangements for the proposed Ash Disposal Facility required for the 150 MW plant

### *3.3.7. Waste Management and Treatment*

The proposed Transalloys Power Plant will be a zero liquid discharge (ZLD) facility utilizing a holding recycle dam to re-use waste water to minimize the facility's water consumption as well as an evaporation pond to eliminate wastewater discharge. Precipitation of solids in the evaporation pond is expected to be minimal. The evaporation pond will be divided into two sections to allow each half to be cleaned approximately every 5 years (for the 150 MW plant). Disposal of solids from the evaporation pond is expected to occur at the ash disposal facility or a licensed off-site disposal facility.

Bed ash and fly ash, produced as a result of combustion, will be pneumatically conveyed to ash storage silos and subsequently wetted to minimise dust generation before being conveyed to the ash disposal facility.

**Liquid Waste Treatment:** Domestic waste will be treated in an on-site sewage treatment plant during plant operation (temporary chemical toilets will be used during construction). Treated effluent from the sewage treatment plant will be recycled. Disposal of sludge will be at a licensed off-site disposal facility.

As far as possible provision will be made for the re-use of the treated effluent for dust suppression, ash quenching and soil conditioning. Waste water forwarding pumps shall circulate the water from the treatment facility to places of usage.

**Oily Waste Treatment:** At the power plant, waste water potentially containing lubricants, oil, grease etc. will be routed to the Oily Waste Treatment System. The Oily Waste Treatment System consists of the following:

- Oily wastewater sump(s) with sump pumps.
- Separation of oil from water using suitable process
- Removed oil is disposed of through authorized external contractors

**Chemical Waste:** At the power plant, wastes potentially containing high or low pH wastewater are routed to the Chemical Waste Treatment System. The Chemical Waste Treatment System consists of the following:

- Chemical wastewater sump(s) with sump pumps.
- One neutralisation basin with mixing systems.
- Common acid and caustic addition systems, using the demineraliser regeneration subsystems.
- Neutralized water transfer pumps.
- All interconnecting piping, valves, controls, instrumentation and accessories for a complete system.

**Solid waste management:** Power plant waste will include the following:

- » Metallic wastes. This type of waste will be collected in bins for occasional collection from the site, to be sold to or removed by specialist contractors by road transport.
- » Oils and cleaning chemicals. Waste oils and chemicals will be recycled by external contractors. Empty oil drums will be returned to suppliers for recycling or re-use.
- » Miscellaneous waste. This includes paper, plastic, glass, cloth, etc., which will be collected and re-used wherever possible and once deemed waste, will be discarded as per relevant regulations.

Waste will be separated at source and contained in appropriately labelled containers. All bulk waste containers on site (skips, bins, drums etc.) shall be appropriately labelled to show what class and type of waste can be disposed of in them. Containers shall be appropriately designed to store liquid, solid, hazardous or non-hazardous waste. Solid and liquid wastes will not be mixed. It is anticipated that waste will be removed from site on a weekly basis.

**Waste storage and separation during construction:** During the construction phase, hazardous and general (non-hazardous) waste will be collected at source and transported for storage at temporary or permanent storage facilities. These storage facilities will be appropriately designed with appropriate flooring / lining, covered (for protection from direct sunlight, wind and rain) if necessary, and bunded where required to contain accidental spills or leaks. Storage will be in accordance with the requirements of the National Norms and Standards for the storage of waste promulgated in Government Notice 926 in terms of the National Environmental Management: Waste Act (Act No 59 of 2008).

**Waste transport:** Waste will be transported from source (power plant) to the temporary storage or disposal facilities in an appropriate manner:

- » The nature, composition and integrity of transport packaging and containers will be appropriate to the type and class of waste being transported.
- » Transport vehicles will cater for the type, class and quantity of waste being transported in terms of its composition, load capacity, covering etc.
- » Transport vehicles will follow the traffic speed and safety requirements on site.
- » Loading and unloading procedures to avoid waste loss will be followed.
- » Employees will be trained in the correct procedure to address accidents and emergencies.
- » All transport vehicles will be equipped with suitable materials or equipment to contain, manage and remove accidental spillages.
- » Vehicles carrying hazardous wastes shall be labelled appropriately.

**Ash Disposal:** The ash disposal facility is sized to accommodate the estimated bottom ash and fly ash from the plant for 25 years assuming a conservative availability and capacity factor. For the 150 MW plant, the ash disposal facility provides storage for a volume of approximately 8 million cubic meters of ash and would have a footprint of approximately 35ha in extent and will be approximately 50m high. The 55MW plant provides for a volume of approximately 1.8 million cubic meters of ash and would have a footprint of approximately 10ha in extent and will be approximately 50m high. The ash disposal facility (and liner system) will be designed according to the requirements for waste disposal as contained in Regulation 636 of August 2013 published in terms of the NEM: Waste Act (Act No 59 of 2008). Refer to Section 3.3.6 for more information regarding the ash management system.

## 3.4. Circulating Fluidised Bed Boiler Technology

Fluidised bed combustion (FBC) is a proven technology used for power plants with widespread application internationally but very limited application in South Africa. The technology has proven to be well suited to burning fuels that are difficult to ignite, such as petroleum coke and anthracite, low quality fuels like high ash coals and coal mine wastes, and fuels with highly variable heat content, including biomass and mixtures of fuels. The technology therefore has the ability to utilise a wide range of fuels.

Fluidised beds suspend solid fuel (such as coal / biomass) on upward-blowing jets of air during the combustion process. It results in a turbulent mixing of gas and solids. The tumbling action, much like a bubbling fluid, provides effective chemical reactions and heat transfer. The FBC has a cyclone filter to separate solid material from the hot flue gases which leave the exhaust of the furnace. The solids from the filter are re-circulated into the bed.

The technology burns fuel at temperatures of 760°C to 930°C, a range where nitrogen oxide formation is lower than in traditional pulverized coal units. FBC technology also reduces the amount of sulphur emitted in the form of sulphur dioxide emissions. Limestone can be added to capture sulphur and prevent its release to the atmosphere as sulphur dioxide.

The following is a basic description of the process flow for the generation of electricity from coal at the proposed power plant from the sourcing and conveyance of fuel to the distribution of electricity to the electricity grid utilising FBC boiler technology (also refer to Figure 3.2):

1. **FBC Boiler:** Fluidised beds consist of a bed of sand which is heated up and fluidised by passing streams of air through the sand. Solid fuel (such as coal or biomass) is introduced to the hot suspended sand on upward-blowing jets of air and the solid fuels starts to combust. The result is a turbulent mixing of gas and solids. The tumbling action provides effective chemical reactions and heat transfer. The FBC has a cyclone filter to separate the sand and coarse particles from the hot flue gases which leaves the exhaust of the furnace. Due to the design of the FBC, limestone can be injected directly into the bed where it neutralises most of the sulphur which is released from the fuel during combustion leading to very low Sulphur Dioxide ($SO_2$) emissions.

2. **Smoke Stacks:** Gases that are released from combustion in the furnaces, are filtered and then released into the atmosphere through smoke stacks.

3. **Cooling:** The proposed power plant will be designed with dry cooling technology in order to significantly reduce the plants overall water consumption requirements.

» **Flue Gas Desulphurisation:** $SO_2$ emissions from the power plant will be controlled by means of limestone injection in the combustion zone of the FBC boilers. Limestone will be delivered to the power plant by trucks. The estimated limestone consumption is dependent on the total sulphur present in the coal. The in-bed capturing of sulphur by adding limestone to the boiler combustion chamber eliminates the need for external flue gas desulphurisation and due to low combustion temperatures, a resultant reduction in the formation of $NO_x$ (nitric oxide and nitrogen oxide) occurs.

4. **Turbine:** The high pressure steam generated through the power generation process is piped to turbines. The steam passes through the turbine blades, causing the blades to turn. The movement of the steam through the turbines causes the thermal (heat) energy to be converted to mechanical energy.

5. **Generator:** The turbine is linked to the rotor of a generator. The rotor is an electromagnet which spins inside large coils of copper to generate electricity (alternating current (AC)), which is essentially what is produced by a power station.

6. **Transformer:** This is an electrical device by which AC current of one voltage is increased or stepped up and the current flow is reduced.

7. **Transmission:** The electricity is then fed into a high voltage yard and then fed into the 33kV power line which feeds into the electricity grid at the Eskom Transalloys Substation.

## 3.5. Life-cycle Phases of the proposed Power Station

### *3.5.1. Construction phase*

Construction of the proposed coal-fired power station is expected occur over a period of approximately 42 months (18 months for 55MW plant). Approximately 1 500 employment opportunities are expected to be generated over this period (estimated split is 50% high skilled; 30% semi-skilled; 20% low-skilled workers)[12]. It is estimated that approximately $63 million, $34 million and $24 million will be paid to the various contractors over the 34 month period construction payroll for high-skilled, semi-skilled, and low-skilled craft labour, respectively. It is expected that primarily medium- and low-skilled workers from the surrounding towns of Witbank, Thushanang, Hlalanikahle, Empumelelwni, Ackerville, and Clewer will be recruited[13].

The construction activities will vary marginally between the 55MW and 150 MW plant alternatives and will, in general, involve the following:

» Prior to initiating construction, surveys of areas to be occupied by the power station, the ash disposal facility, the on-site substation, the water supply pipeline servitude will be undertaken;
» Access roads will need to be established to the plant and ash disposal facility from the main Transalloys access road;
» Site preparation activities will include clearance of vegetation and excavations for foundations. These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site;
» Thereafter civil works will take place which will involve concrete works for foundations, establishment of stormwater pollution control dams, the production unit (which houses the turbines, generator etc.), stacks, cooling towers (if applicable), substation and associated infrastructure;
» Mechanical and electrical work will then follow;
» The components for the proposed power plant will be transported to site by road. Some of the power station components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[14] by virtue of the dimensional limitations (i.e. length and weight). Components of various specialised construction and lifting equipment are required and will need to be transported to site. In addition, typical civil engineering construction

[12] 400 opportunities for 55MW power plant

[13] Note that this has been calculated for the 150 MW power plant alternative. The employment and remuneration values will be lower for the 55MW plant alternative

[14] A permit will be required for the transportation of these abnormal loads on public roads.

equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.)
» Ancillary infrastructure such as office buildings, the water supply pipeline and a power line linking to the electricity transmission grid will be established
» Laydown and storage areas will be required for the typical construction equipment which will be required on site.
» As construction is completed in an area, and as all construction equipment is removed from the site, the affected areas will be rehabilitated where practical and reasonable.

The smaller 55MW plant will consist of a decommissioned power plant, currently situated in Austria, Europe. The plant is proposed to be dismantled, refurbished and shipped to South Africa, whereupon the dismantled components will be erected on site and the necessary services installed. The re-design of components will be undertaken where necessary in order to ensure successful relocation and establishment on the site.

A construction phase drawing indicating the position of the infrastructure for the 150 MW plant alternative is included in Figure 3.6 and indicates the position of the following:
» Material delivery access road (branching off existing access road) adjacent to existing slag dumps
» Employee entrance road (branching off existing access road)
» Material staging areas
» Laydown areas
» Water tanks and purification facility
» Construction management office
» Offices, canteens, induction buildings, medical buildings etc.

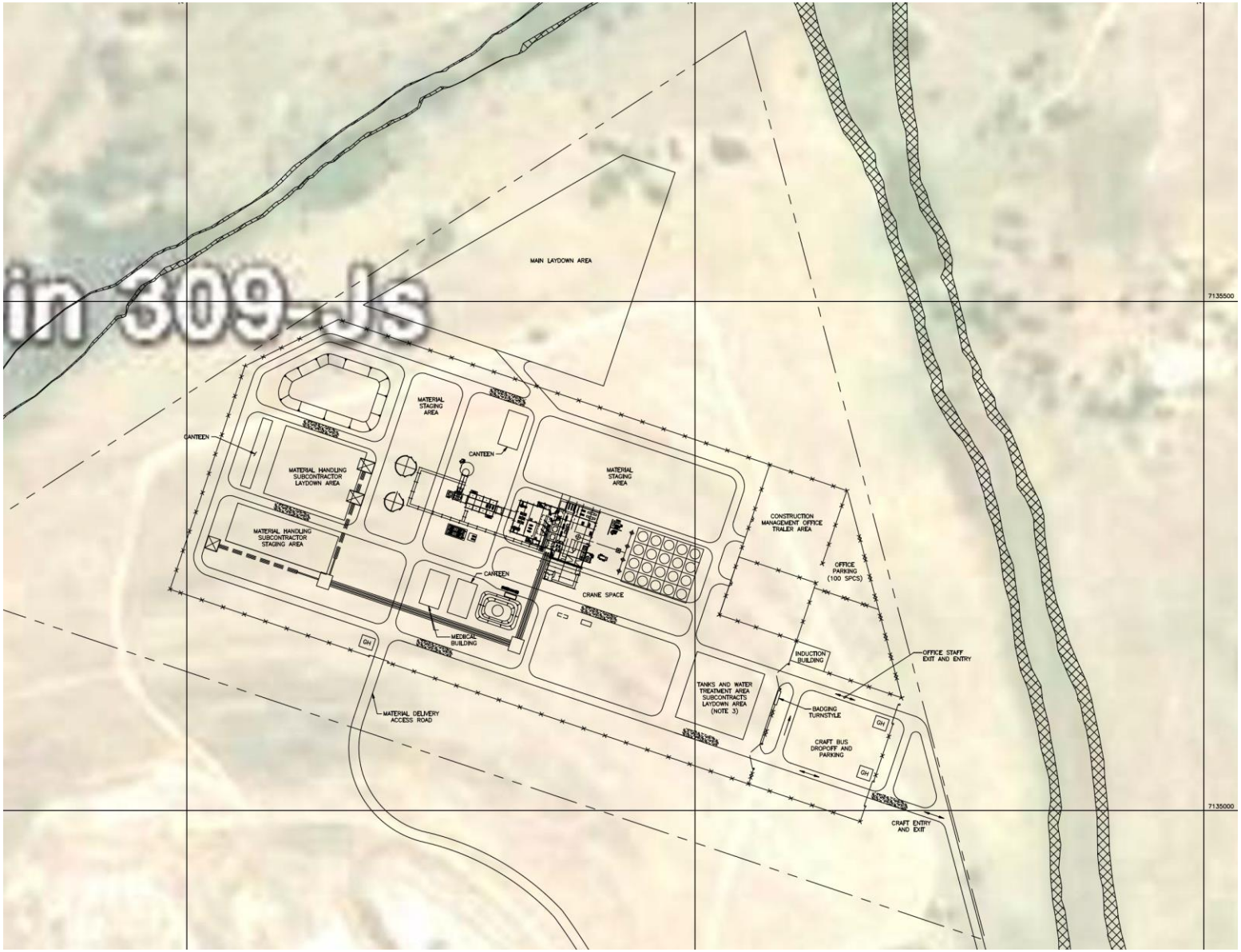



**Figure 3.6:** Construction phase facilities for the 150 MW plant alternative

### *3.5.2. Operations and maintenance phase*

Prior to the operation of the power station, testing and trials will need to be undertaken. In order to operate the power station, resources are required (input), and processes and outputs occur from the electricity generation process. This concept is outlined in Figure 3.7 further illustrating that in order to operate a coal-fired power station, natural resources such as coal and water will be required. For combustion to occur, coal and compressed air are required. Water is required in the power generation process – it is converted to steam for energy conversion (from thermal energy to mechanical energy). Water is also used for cooling in a power station. The output of the process is electricity as well as waste and emissions. The power station will operate for 24 hours a day and 7 days a week. The economic life of the power station is approximately 25 years.

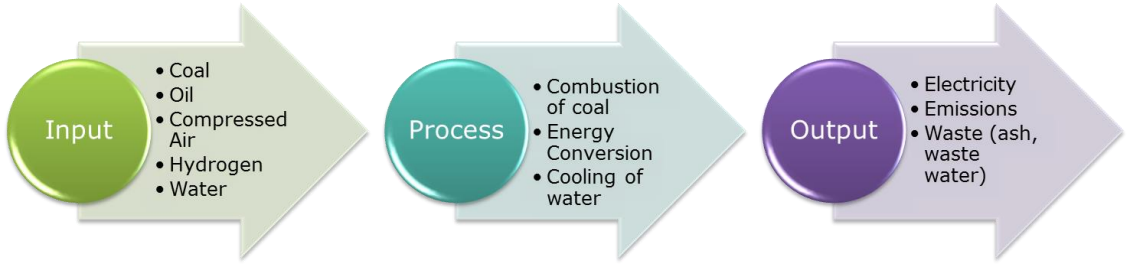



**Figure 3.7:** Resources (input), processes and outputs (waste) for a coal-fired power station

The proposed facility (150 MW facility) will create approximately 73 permanent employment positions that will be retained for ~25 years, amongst the following broad categories:

- Operations – 24 staff
- Maintenance – 32 staff
- Technical services – 9 staff
- Administration – 8 staff

The most notable component of the operations and maintenance fixed expenses of the power station is the cost of salaries and wages for staffing requirements. A total wage bill of approximately $2.9 million per annum for operations and maintenance staff is relevant. In total fixed operations and maintenance costs are approximately $33 million USD/kw-year. Preliminary non-fuel variable operation and maintenance costs are calculated at approximately $9.27 USD / MWh (for 150 MW option).

### *3.5.3. Decommissioning of a Coal-Fired Power Station*

The decommissioning and closure of the proposed project will be done on fulfilment of the operational life of the plant (25 years), unless it is considered feasible and desirable to extend its life. A detailed plan for the decommissioning and closure of the facility will be drawn up before operations are ceased and submitted to the relevant competent authority for authorisation and ultimate implementation.

**Decommissioning Activities:** Similar to construction, the removal of the infrastructure associated with the project would involve the preparation of the area, given the amount of machinery and workers that will remain and work on the decommissioning. The following decommissioning activities are relevant:

- Operational access roads are expected to be in good condition and be appropriate for the transit of decommissioning equipment (heavy cranes, special trucks, etc.).
- A small temporary decommissioning camp may be established with associated staff facilities.
- Laydown areas will be prepared as required. In this regard vegetation may require stripping and topsoil may be stockpiled for use in rehabilitation.
- All waste materials and chemicals will be removed for reuse in other facilities or proper disposal through authorised waste management service providers.
- The elimination of all lubricants and chemical products stored in the plant will be carried out. These products may be sold or turned over to an authorised waste management service provider, as they are not the plant's main components.
- Reusable elements are components that can be used again, i.e., are not waste. It is advantageous to find a use for these so-called sub-products, due to the reduced costs involved with the consequent economic and environmental benefits.
- Concrete structures and buildings (including foundations) will be demolished and the rubble will be disposed of at appropriate facilities, unless otherwise agreed for an alternative use in line with the decommissioning and closure plan.

**Rehabilitation:** Following decommissioning and removal of all project material from the site, the disturbed areas will be rehabilitated to a state reflective of anticipated future use. Where possible, rehabilitation will be conducted concurrently with decommissioning. The following rehabilitation activities are relevant:

- The existing profiles of the land affected will be improved and stabilised thereby leaving profiles not incompatible with the topography of the area, which is essentially flat.
- Ripping of compacted soils will be done prior to adding topsoil, which will be done by mechanical means. It is expected that there will be a sufficient amount of topsoil and/or subsoil moved and stockpiled during the decomissioning phase to facilitate rehabilitation.
- If required, potential areas or land for extracting topsoil or subsoil will be identified. The land capability characteristics of such areas should be similar to the affected soils (same texture, colour, permeability, etc.).
- Vegetation will be re-established. The plant species used will match those naturally occurring in the area as far as possible.

**Aftercare and Maintenance:** Following rehabilitation, a period of maintenance and aftercare will be required to ensure that rehabilitation is successful. In this regard, the following activities are relevant:

- Fertilisation of soil depending on soil fertility test results
- Control and removal alien/invasive species
- Replacement of unhealthy plants and altering vegetation composition, if needed
- Implementation of erosion controls (if required)
- Support irrigation (if required)
- Auditing of vegetation recovery and adaption of strategies where necessary.

# PROJECT ALTERNATIVES CHAPTER 4

In terms of the Environmental Impact Assessment (EIA) Regulations, reasonable and feasible alternatives are required to be considered within the Environmental Impact Assessment process. All identified, feasible alternatives are required to be assessed in terms of social, biophysical, economic and technical factors.

A key challenge of the EIA process is the consideration of alternatives. Most guidelines use terms such as 'reasonable', 'practicable', 'feasible' or 'viable' to define the range of alternatives that should be considered. Essentially there are two types of alternatives:

» incrementally different (modifications) alternatives to the project; and
» fundamentally (totally) different alternatives to the project.

Fundamentally different alternatives are usually assessed at a strategic level, and EIA practitioners recognise the limitations of project-specific EIAs to address them. Electricity Generating alternatives have been addressed as part of the National Integrated Resource Plan (IRP) by the Department of Energy. In this regard, the need for power generation from coal as part of the technology mix for power generation in the country in the next 20 years has been identified. Notwithstanding, this national strategic imperative for grid strengthening, Transalloys has identified a direct need for the proposed power station in order to remain competitive and sustainable. This has been informed by the regional situation (influenced by ready supply of resources) in a province not generally suited to the implementation of large-scale renewable energy facilities and as a result, Transalloys have not considered any other power generation options.

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives to:

» The property on which, or location where, it is proposed to undertake the activity;
» The type of activity to be undertaken;
» The design or layout of the activity;
» The technology to be used in the activity; and
» The operational aspects of the activity.

These alternatives are discussed below.

## 4.1. Site Alternatives

### *4.1.1. Locational factors for site selection and suitability*

In the initial feasibility study commissioned by Transalloys (as described in the Scoping Report), the development of the proposed power station was identified to be feasible based on the following:

» Available land owned by Transalloys.
» Location of Transalloys within close proximity to existing coal reserves.
» Abundance of low grade coal including coal discards of a quality below Eskom rejection limits or export standards.
» Favourable logistical conditions due to proposed use of overland conveyor systems for the supply of coal from the Landau Colliery to Transalloys (which has since been determined not to be feasible).
» Proximity of the proposed power station to existing electrical infrastructure for ease of grid connection (via the Eskom Transalloys Substation).
» Abundance of surplus mine / industrial water in the area and availability of raw water supply to the project.

Given the above conditions, no other alternative areas not in close proximity to the existing Transalloys industrial complex were considered to be reasonable or feasible.

### *4.1.2. Selection of the proposed site(s) for development*

During the Scoping Phase, five site alternatives were identified and evaluated as being potentially feasible for assessment during the EIA phase.

» **Site 1**: is located directly north-east of the existing slag dumps on old agricultural fields nestled between the confluence of the Brugspruit River and tributary of the Brugspruit which form the northern and eastern boundaries of the site.
» **Site 2:** is located immediately east of the Transalloys smelter complex on open grasslands. The site is traversed by an overhead power line and infrastructure associated with the smelter facility is also situated within this site.
» **Site 3**: is located between the R547, which forms the eastern boundary, and the Brugspruit, which forms the western boundary. It comprises of grasslands and a few clusters of planted trees.
» **Site 4**: is located between the R547, which forms the eastern boundary, and the Brugspruit, which forms the western boundary, just further north of site 3. This site consists of open grasslands and a few planted trees, with some disturbance (quarry/borrow pit) and one built-structure present on the site.

» **Site 5**: is located between the Transalloys smelter complex, a railway line and rail siding and the Evraz Highveld Steelworks on an agricultural field. It consists of Portions 25, 26, 33, 36 and 37 of the Farm Elandsfontein 309 JS and is owned by Evraz Highveld Steel. This portion of land is currently used for agricultural purposes (maize crops).

**Technical evaluation:** The five sites were provided to the project engineers for consideration of technical and financial suitability. An evaluation was undertaken based on project specific criteria required to support the proposed power plant, including the associated ash disposal facility and evaporation pond, and possible future expansions. The criterion and scoring[15] of the sites based on the results of the siting report are reflected in Table 4.1 below:

**Table 4.1:** Criterion for scoring of alternative sites

| Criterion | Site 1 | Site 2 | Site 3 | Site 4 | Site 5 |
|---|---|---|---|---|---|
| Topography | 8 | 7 | 5 | 5 | 10 |
| Earthwork Constructability | 7 | 7 | 8 | 8 | 8 |
| Distance to Transmission | 7 | 8 | 6 | 5 | 8 |
| Distance to Coal Supply | 8 | 8 | 8 | 8 | 5 |
| Distance to Water Pipeline | 8 | 8 | 10 | 9 | 6 |
| Site Ownership | 10 | 10 | 9 | 9 | 5 |
| Distance to Ash Disposal | 8 | 7 | 5 | 6 | 3 |
| Expansion Capacity | 7 | 7 | 8 | 6 | 9 |
| Transportation | 9 | 9 | 9 | 9 | 7 |
| Environmental | 6 | 5 | 7 | 7 | 9 |
| **Total** | **78** | **76** | **71** | **72** | **70** |

**Results of technical evaluation:** Ultimately site 5, which was identified as the most preferred site during the scoping phase from an environmental perspective (but least favoured from an agricultural perspective due to its cultivated status on high potential agricultural soils), was determined to be the least suitable site from a technical perspective with the lowest overall score. The development of site 5 is not recommended due to poor access arrangements, land ownership issues (in favour of Highveld Steel) and pending applications for mining rights over a section of this site. Sites 1 and 2 were identified to be the most technically suited

[15] Each candidate site was evaluated on the technical criteria listed above by assigning a score (1 through 10) to each respective criterion. A score of 10 was most favourable, 5 as moderately favourable, and 1 was least favourable. Scores for each criterion were summed to determine a total score for each site.

sites and were selected for the development of the power station and ash disposal facility. Although sites 1 and 2 did not rank as the most environmentally suited (primarily due to wetland and watercourse proximity), they were not considered to be undesirable for development at the scoping phase.

Figure 4.1 illustrates conceptually the development of the power plant on all five alternative sites as well as:

» The relative proximity of the 5 site alternatives to the Transalloys smelter facility;
» The position of proposed access roads;
» The position of proposed power lines linking to the existing Transalloys Substation;
» The size constraints on each site within which to develop the entire project (excluding Site Alternative 5); and
» The relationship of mining rights over site alternative 5 (indicated by hatched area).

**Mining expansion:** It emerged on further consultation with Anglo Coal after the Scoping phase that Anglo American Coal South Africa has mining rights over site 3 and site 4 which are to be included in the Navigation Section of the proposed Landau Colliery Life Extension Project. Landau Colliery is currently in the process of applying for the requisite environmental approvals for the proposed colliery expansion project. The proposed Landau Coal Expansion Project, should it be approved, effectively renders sites 3 and 4 unfeasible for the purposes of the proposed power station project. Similarly the entire Site Alternative 5 is now subject to applications for mining rights by two mining companies.

**Overall site suitability:** Through the site evaluation process, sites 1 and 2, which are nearest to the Transalloys smelter complex were identified as being the most suitable sites for the proposed power station project. Furthermore, these sites are not affected by surface rights. As a total area of approximately 80ha is required for the power plant and the ash disposal facility, both sites are required to accommodate the entire footprint of the project (one site for the power plant and associated infrastructure and one site for the ash disposal facility).

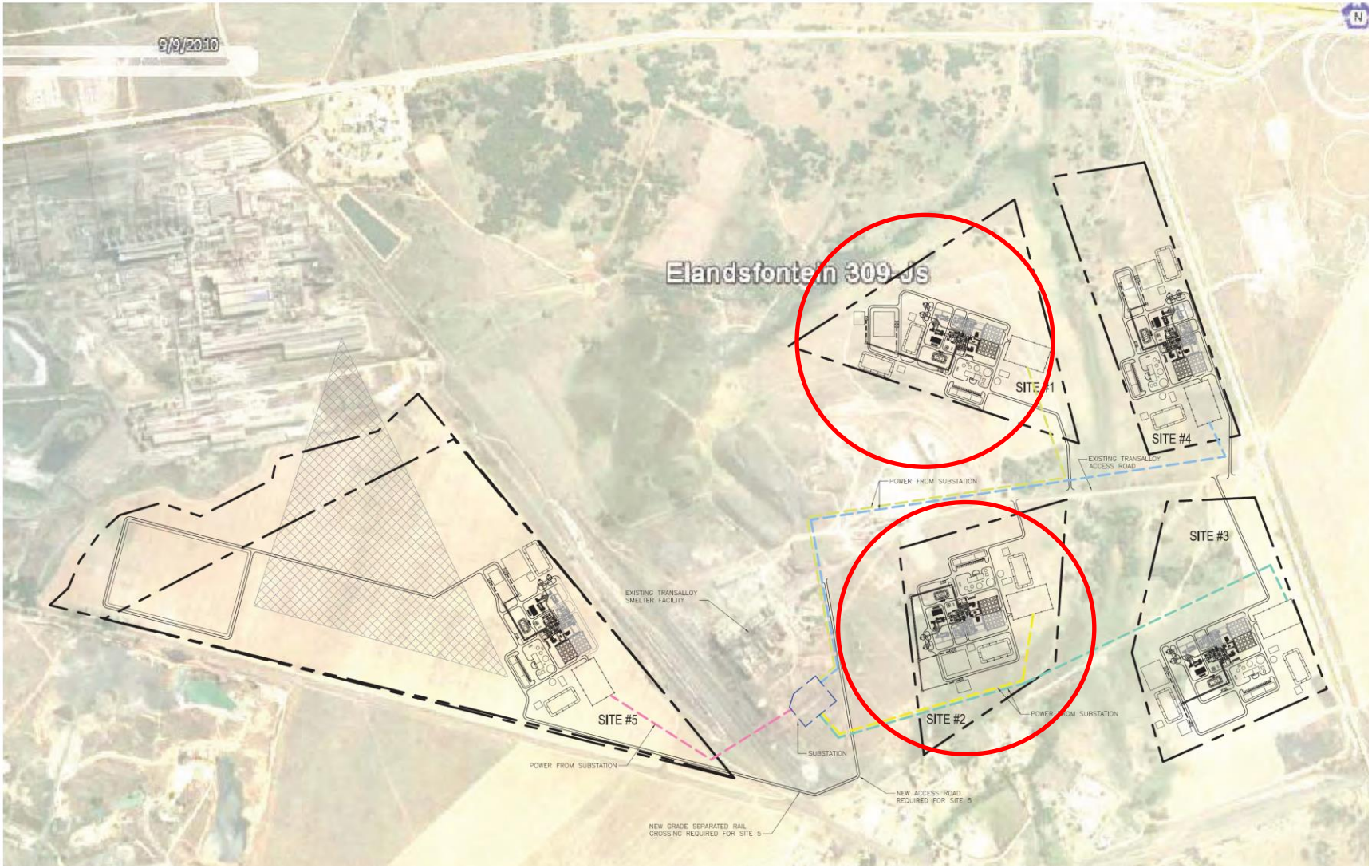



**Figure 4.1**: Power station conceptual layout of the power plant and power line routes for the five site alternatives considered (excludes ash disposal facility). Preferred sites (Site 1 and 2) circled in red.

The process for consideration of the site alternatives was therefore undertaken by way of a life cycle assessment. As site alternatives 1 and 2 have emerged as the most suitable site alternatives, the potential environmental impact will be assessed through this EIA investigation (refer to Chapter 7) for:

» Construction and operation of the power station on site alternative 1
» Construction and operation of the ash disposal facility on site alternative 2

## 4.2. Design or Layout Alternatives

Design or layout alternatives have been identified during the EIA process in response to commercial decisions as well as the environmental constraints presented on the site (in the form of wetlands). Design / layout alternatives considered include the development of a new 150MW power station or the use of an existing and decommissioned 55MW power plant.

### *4.2.1. 150 MW power station*

A preliminary layout for the 150MW power station and associated infrastructure was provided for investigation and assessment. The 150MW power plant and associated infrastructure has a total footprint of approximately 68 ha and therefore two of the alternative sites (site 1 and 2 which are each 38 ha in extent) were required to accommodate the 150MW power station. This alternative results in the ash disposal facility of the power plant impacting on a section of wetland delineated on site 2.

### *4.2.2. 50 MW power station*

The smaller 55MW plant will consist of a decommissioned power plant, currently situated in Austria, Europe. The plant is proposed to be dismantled, refurbished and shipped to South Africa, whereupon the dismantled components will be erected on site and the necessary services installed. The re-design of components will be undertaken where necessary in order to ensure successful relocation. The total footprint requirements of the 55MW power station is 23 ha and can therefore be accommodated within either of the two remaining site alternatives, with site alternative 1 being preferred due to its separation distance from Clewer. This 55MW power station is preferred as the total footprint requirements are such that no development within the wetland areas is required. From an environmental perspective, the 55MW option is the preferred alternative.

## 4.3. Technology Alternatives

Technology alternatives considered for the project:

» The **fuel combustion technology** – conventional pulverised coal fired or circulating fluidised bed boiler technology; and
» **Cooling Systems technology** – the power station will make use of dry cooling technology, either direct or indirect.

### *4.3.1. Fuel Combustion Technology*

Technologies considered include conventional pulverised coal fired or circulating fluidised bed boiler technology. A basic description of the technologies is provided below.

#### *a) Conventional Coal Fired Power Station*

A conventional coal-fired power station produces electricity by the burning of pulverised coal and air in a steam generator, where it heats water to produce steam. The steam flows through a series of steam turbines which spin an electrical generator to produce electricity. The exhaust steam from the turbines is cooled, condensed back into water, and returned to the steam generator to start the process over. These plants provide most of the electrical energy used in many countries, i.e. a tried and tested method.[16]

The 55MW power station alternative will require coal to be pulverised prior to feeding of the coal into the boiler. A flue gas desulpherisation (FGD) plant consisting of a wet scrubber will be installed and sulphur from the flue gas will be removed through limestone suspension and subsequently processed to gypsum.

#### *b) Circulating Fluidised Bed Boiler Technology*

Fluidised bed combustion (FBC) is another technology used for power plants. There are different designs of FBCs, namely two major groups, atmospheric systems (FBC) and pressurised systems (PFBC), and two minor subgroups, bubbling (BFB) and circulating fluidized bed (CFB)[17].

CFBs suspend solid fuel (such as coal / biomass) on upward-blowing jets of air during the combustion process. It results in a turbulent mixing of gas and solids. The tumbling action, much like a bubbling fluid, provides effective chemical reactions and heat transfer. The CFB has a cyclone filter to separate solid material from the hot flue gases which leave the exhaust of the furnace. CFB reduces the amount of sulphur emitted in the form of $SO_2$ emissions by injection of a sorbent such as limestone. The solids from the cyclone filter are re-circulated into the bed. By using this technology, SO and NO emissions are

[16]http://en.citizendium.org/wiki/Conventional_coal-fired_power_plant
[17] (http://en.wikipedia.org/wiki/Fluidized_bed_combustion).

reduced because a sorbent, such as limestone, can be used efficiently. Also, because the combustion temperature is relatively low, the amount of NOx gases formed is generally lower than those produced using conventional technology. The 150 MW power plant is based on CFB technology.

### *4.3.2. Cooling Systems technology*

The steam that is produced and converted to mechanical energy at a power plant must be recovered through condensation (conversation of the steam (vapour) to water). Cooling systems for a coal-fired power station can be either wet-cooled, direct dry-cooled or indirect dry-cooled systems. Dry-cooling results in resource saving in terms of water conservation, and is generally utilised in water-stressed environments. Due to the study area being water-stressed, only dry-cooling systems were considered for the project. The two dry-cooling systems are briefly described below.

#### *a) Direct Dry cooling*

In this system, the steam from the turbines goes to dry, air-cooled heat exchangers. Fans are used to blow air over the heat exchanger causing water vapour to condense into liquid. The liquid (water) is pumped back to the boiler for re-use**.** No cooling towers are needed for this system; therefore water loss by evaporation is prevented. This system is utilised at Matimba Power Station located near Lephalale, and will also be used by Medupi Power Station (under construction). Issues associated with this technology include increased noise levels as a result of the additional fans required.

#### *b) Indirect Dry cooling*

A natural draft dry cooling tower is used to cool water from the condensor. Warm water from the condensers is pumped to cooling towers. Within the cooling tower, bundles of cooling elements are arranged in rings. Cooling water is sent into the elements and cooled water returns to the condenser for re-use. This system prevents water loss by evaporation, as it is a closed system. This system is utilised at the Kendal Power Station located near eMalahleni in the Mpumalanga Province. Associated issues include additional visual impacts associated with the large cooling towers required.

Through the technical feasibility studies undertaken for the project, direct dry cooling technology has been selected as the preferred technology for implementation at the power station. An indirect dry cooling system is not considered practical due to space considerations on the site. This is the alternative assessed within this EIA.

### *4.3.3. Water pre-treatment alternatives*

The following water pre-treatment process alternatives would likely be required at the Transalloys Power Plant, the costs of which have been modelled by the project engineers through a life cycle analysis[18]:

» Potable Water - This source would be suitable for direct use for the service water and potable water systems at the power facility without additional pre-treatment. It would also be suitable for supply to a Reverse Osmosis System to generate demineralized water makeup for the power plant, with dechlorination and cartridge filters the only pre-treatment needed. Present-day tariffs are calculated at R 33.40 per $m^3$.
» Process Water - Extensive pre-treatment would be needed for use of this source at the power facility. This would probably include lime and soda ash softening in a clarification process, followed by filtration using microfiltration or ultrafiltration. Potable water for drinking and plumbing systems would need to be sourced separately or a separate small package treatment system would be needed. Present-day tariffs are calculated at R 0.35 per $m^3$. Other considerations for this option include:
  * Potential increased wastewater production due to reduced Reverse Osmosis (RO) efficiency, which would in turn necessitate a larger evaporation pond.
  * Process water will result in precipitated solids from the pre-treatment process, which would need to be transported to the ash landfill and would need regulatory approval.
  * Process water is likely to be more highly variable in quality, depending upon the mine source, which may make operations more difficult.
  * Process water may result in the need for materials of construction upgrades for the service water system and equipment that uses service water.

Despite higher present-day tariffs for potable water, and based on the need to minimize up-front capital costs and reduce life cycle costs, it was recommended that the project pursue obtaining potable water from EWRP instead of process water. This remains true if water is sourced from the nearby Highveld Steel.

### *4.3.4. Operational Alternatives – Pollution Control*

[18] Note that calculations were based on water quality data from the eMalahleni Water Reclamation Plan (EWRP).

Due to environmental and health impacts that could pose a risk during the operation of the coal-fired power station, methods are considered for ash (waste) management and air emissions control.

**a) Ash management**

The ash management system will use dry-ashing (water used only for ash conditioning). Above-ground ash disposal to a lined ash disposal facility will be undertaken. Wastewater generated at the power station will be utilised for dust suppression at the ash disposal facility.

**b) Air Emission Control**

Burning of coal releases $CO_2$, $SO_2$, $NO_x$, and other pollutants into the atmosphere. Through the use of CFB technology, $SO_2$ and $NO_x$ emissions are reduced because a sorbent, such as limestone, can be used efficiently. Also, because the combustion temperature is relatively low, the amount of $NO_x$ gases formed is lower than those produced using conventional technology.

## 4.4. Linear infrastructure alternatives

### *4.4.1. Water pipeline route alternatives*

This section considers the alternative water pipeline routes based on the two most feasible water suppliers to the project, namely the eMalahleni Water Recovery Plant (EWRP), which was identified as a suitable water supplier during the Scoping phase, and the EVRAZ Highveld Steel Works, who were approached during the EIA phase for the reasons described below. The proposed water pipeline alignments are illustrated in Figure 4.3. Please note that the construction of the pipeline itself does not constitute a listed activity as the thresholds for peak throughput and internal diameter are not triggered. As the proposed water pipeline is required to traverse watercourses and falls outside of the power station study area, alternatives are considered here.

**a) Water pipeline alignment option 1 on Landau Colliery surface rights area**

This pipeline route was identified at Scoping and is approximately 9.8km in length traversing the surface right area of the Landau Colliery. This pipeline was aligned with existing roads for the majority of its route. From the EWRP, the pipeline ran in a north-westerly direction parallel to the existing Apex Road for approximately 5.5km, crossing the R555 (Provincial Road) before passing the Landau Colliery. The pipeline then deviated from Apex Road before traversing open land for 2km

after which point it aligned with Bailey Avenue (R547) for 1.2km before heading west along the Transalloys road, in the direction of the proposed power station.

**b) Water pipeline alignment option 2 on Landau Colliery surface rights area**

The proposed expansion of the Landau Colliery (Landau Colliery Life Extension Project) in terms of a mining right held by Anglo Coal and the potential impact of the pipeline on Anglo's activities, resulted in a meeting between Transalloys, Anglo Coal and the respective EAPs. This meeting resulted in a discussion of an alternative route over the surface right area which required the realignment of the pipeline (option 1) at a certain section so that the entire length of the pipeline over the mining right area is situated parallel to existing roads (refer to Appendix D). The pipeline runs adjacent and parallel to Apex Road until the junction with Bailey Road, at which point the pipeline turns in a northerly direction passing through the town of Clewer and continuing along Bailey Road in the direction of Transalloys. This route is approximately 10.5km in length from the EWRP to the proposed power station site and will not deviate away from existing roads.

Subsequent to the above-mentioned meeting, revision of the pipeline route and consideration of the route by Anglo Coal, the revised route was not approved on the basis of future expansion and infrastructure development within the Landau Colliery surface rights area. Future plans by Anglo Coal to develop within their surface rights area present a potential risk to the pipeline and therefore sustainable supply of raw water to the proposed power plant. A recommendation was made to avoid the surface rights area to access the EWRP. This effectively extended the route to in excess of 15km from the proposed power station to the EWRP.

**c) Water pipeline alignment option 3 to EVRAZ Highveld Steel Works**

Considering the above limitations for the conveyance of the required water, the applicant approached the neighbouring EVRAZ Highveld Steel works to determine the availability of surplus water supply and whether an offtake of water from their municipal supply could be provided. This proposal was acceptable to Highveld Steel and subsequently a water supply pipeline route was determined and assessed within this EIA report. The proposed water pipeline exits the Highveld Steel Works at its south eastern boundary, crosses the freight railway line, traverses the western tributary of the Brugspruit and enters the proposed power plant from the west. This route is approximately 2km in length and is significantly shorter than the pipeline from the EWRP, resulting in reduced environmental and capital cost.


**Figure 4.3:** Water pipeline route alternatives. The orange line and blue lines represent route options 1 and 2 from the project site to the EWRP over Landau Colliery surface rights area. The yellow line represents the route between project site and Highveld Steel

**d) Environmental and technical considerations along the water pipeline route from EVRAZ Highveld Steel**

» The proposed water pipeline traverses the western tributary of the Brugspruit
» The majority of the route can be aligned with existing service roads to minimise the potential environmental impact.
» The pipeline will need to be pipe-jacked beneath the existing railway line so that it has as minimal an impact as possible on the railway line servitude.
» A contractual agreement between Transalloys and EVRAZ Highveld Steel is required to receive municipal water via the Highveld Steel infrastructure (flow meters should be implemented for compensation would be required0.
» The water used by Transalloys together with the agreement between the parties must be included in the WULA for the Transalloys Power Plant. Only an update of the IWWMP for Highveld Steel would be needed to reflect this change.

### *4.4.2. Power line route*

The power generated at the power station is planned to be evacuated into the electricity grid at the existing Transalloys Substation located adjacent to the Transalloys smelter facility. The length of the power line from the preferred power plant site (site 1) to this substation is 1.8km, and the route follows existing service roads adjacent to the smelter complex (similarly with site alternatives 2, 3 and 4). No alternative power line alignments are proposed as this route has been optimised to run parallel to the existing service roads adjacent to the smelter complex minimising interference with existing services.

# APPROACH TO UNDERTAKING THE EIA PROCESS CHAPTER 5

An Environmental Impact Assessment (EIA) process refers to that process (dictated by the EIA Regulations) which involves the identification of and assessment of direct, indirect and cumulative environmental impacts associated with a proposed project. The EIA process comprises two phases: i.e. **Scoping Phase** and **EIA Phase**. The EIA process culminates in the submission of an EIA Report (including an environmental management programme (EMPr)) to the competent authority for decision-making. The EIA process is illustrated below:


The construction and operation of the proposed Transalloys 150MW Power Station and associated infrastructure is subject to the requirements of the Environmental Impact Assessment Regulations (EIA Regulations) of June 2010 published in terms of Section 24(5) of the National Environmental Management Act (NEMA, No 107 of 1998). In terms of Government Notice 921 published in terms of the NEM: Waste Act No. 59 of 2008, a waste licence is also required for storage, treatment and disposal of general and hazardous waste. Therefore, an integrated environmental authorisation process is being undertaken for the project. This process will support the application for other permits such as a Water Use License in terms of the National Water Act (Act No 36 of 1998) and an Air Emissions License in terms of the NEM: Air Quality Act (Act No 39 of 2004).

This section provides a brief overview of EIA Regulations and their application to this project. NEMA is national legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. As this is a power generation project which is considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority. Therefore, Transalloys requires authorisation from the National Department of Environmental Affairs (DEA), with the Mpumalanga Department of Economic Development, Environment

and Tourism (MDEDET) acting as commenting authority. In order to obtain this authorisation, Transalloys acknowledges the need for comprehensive, independent environmental studies to be undertaken in accordance with the EIA Regulations of June 2010 (as amended). An integrated application for authorisation and waste licence has been submitted to DEA, and the project has been assigned Application Reference number **14/12/16/3/3/3/97**.

The need to comply with the requirements of the EIA Regulations ensures that decision-makers are provided the opportunity to consider the potential environmental impacts of a project early in the project development process, and assess if environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project. Transalloys has appointed Savannah Environmental (Pty) Ltd, as independent Environmental Assessment Practitioner, to conduct the required Environmental Impact Assessment (EIA) process for the proposed project.

An EIA is also an effective planning and decision-making tool for the project proponent. It allows the environmental consequences resulting from a facility during its establishment, operation and decommissioning to be identified and appropriately managed. It provides the opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issue(s) reported on in the Scoping and EIA reports as well as dialogue with affected parties.

## 5.1. Relevant Listed Activities

In terms of sections 24 and 24D of the National Environmental Management Act (Act No 107 of 1998), as read with Government Notices R543 (Regulations 20–25), R544 and R545 (as amended), environmental Authorisation is required for various activities associated with the proposed Project. The activities that are applied for in terms of NEMA are summarised in Table 5.1, while Table 5.2 summarises those activities applied for in terms of the Waste Act.

**Table 5.1**: Summary of the GN 544, 545 & 546 under the EIA Regulations 2010, listed activities number and short description of the activities that require authorisation under NEMA

| Regulation Notice and Activity No | Description of listed activity |
|---|---|
| **GN R 544** | |
| GN 544, 18 June 2010, Activity 2 | The construction of facilities or infrastructure for the storage of ore or coal that requires an atmospheric emissions license in terms of the National Environmental Management: Air Quality Act (Act No. 39 0f 2004).<br><br>***An in-plant coal stockyard of approximately 2 000m² will be required for the 55MW power station. This activity would also require an Atmospheric Emissions License (AEL).*** |
| GN 544, 18 June 2010, Activity 10 (i) | The construction of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts<br><br>***A 33kV power line is required to be constructed from the on-site switching station to the existing Eskom Transalloys Substation directly adjacent and outside of the Transalloys smelter complex.*** |
| GN 544, 18 June 2010, Activity 11 (xi) | The construction of (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.<br><br>***The siting of the power plant and associated infrastructure will be located on average 100m from the Brugspruit and associated tributary; however construction activities will occur within 32m from delineated wetlands. In addition, the proposed pipeline and access roads may cross drainage lines or watercourses.*** |
| GN544, 18 June 2010, Activity 12 | The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010.<br><br>**An evaporation pond will be required to be constructed exceeding 50 000 cubic metres. A water storage reservoir (steel tank) will also be required to be constructed.** |

| Regulation Notice and Activity No | Description of listed activity |
|---|---|
| GN 544, 18 June 2010, Activity 18 (i) | The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 cubic metres from (i) a watercourse.<br><br>***The construction of a raw water pipeline between Transalloys and Highveld Steel will require the excavation and removal of soil from a watercourse and/or wetland.*** |
| GN 544, 18 June 2010, Activity 22 (ii) | The construction of a road, outside urban areas, (ii) where no road reserve exists where the road is wider than 8 metres.<br><br>***This is required for constructing of the access roads to the site branching off of the Transalloys access road.*** |
| **GN R 545** | |
| GN 545, 18 June 2010, Activity 1 | The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.<br><br>***The proposed Transalloys power station will have a generating capacity of 55MW.*** |
| GN 545, 18 June 2010, Activity 5 | The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.<br><br>***A Water Use License will be required from the Department of Water Affairs in terms of Section 21(g) - Disposal of water or water containing waste that may detrimentally affect a water resource as well as for the storage of waste.***<br><br>***Construction of combustion installations (Category 1) and solid fuel combustion installations (Subcategory 1.1) constitute listed activities identified in GN 248 of 31 March 2010, in terms of Section 21 of the National Environmental Management: Air Quality Act (NEMA: AQA, Act 39 of 2004) and require that an application for an Atmospheric Emissions License (AEL) be made to the licensing authority (Nkangala District Municipality).*** |

| Regulation Notice and Activity No | Description of listed activity |
|---|---|
| GN 545, 18 June 2010, Activity 15 | Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for:<br>*(i)* Linear development activities<br>*(ii)* Agriculture or afforestation where activity 16 in this schedule will apply.<br><br>***The development footprint of the proposed power station and associated infrastructure including the ash disposal facility will be approximately 25 ha in extent.*** |
| **GN R 546** | |
| GN 546, 18 June 2010, Activity 14 (a) (i) | The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) in Mpumalanga (i) in areas outside of urban areas<br><br>***Clearance of natural vegetation on the site of greater than 5ha in extent during the construction phase will be required to be undertaken.*** |

In terms of Government Notice 912 published in terms of the NEM: Waste Act, a waste license is required for the activities listed in Table 1.2.

**Table 5.2**: Summary of the GN 912, listed activities number and short description of the waste activities that requires authorizations under the Waste Act

| Regulation Notice and Activity No | Description of listed activity |
|---|---|
| GN 921, 29 August 2013, Category B, Activity 7 | The disposal of any quantity of hazardous waste to land<br><br>***The power station will require the construction of a lined ash disposal facility over an area of ~10ha. The ash produced through the power generation process is considered to be hazardous.*** |
| GN 921, 29 August 2013, Category B, Activity 10 | The construction of facilities for a waste management activity listed in Category B of this schedule (not in isolation to associated activity).<br><br>***The power station will require the construction of a lined ash disposal facility over an area of ~10ha. The ash produced*** |

| Regulation Notice and Activity No | Description of listed activity |
|---|---|
| | ***through the power generation process is considered to be hazardous.*** |

The EIA process was conducted in accordance with the requirements of the EIA Regulations of June 2010 and in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998), in support of the NEMA and waste licence applications for the proposed project.

## 5.2. Scoping Phase

The Scoping Phase of the EIA process refers to the process of identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This is achieved through an evaluation of the proposed project, involving the project proponent, specialists with experience in EIAs for similar projects, and a public consultation process with key stakeholders (including government authorities) and interested and affected parties (I&APs).

In accordance with the EIA Regulations, the main purpose of the Scoping Phase is to focus the environmental assessment in order to ensure that only potentially significant issues and reasonable and feasible alternatives are examined in the EIA Phase. The Draft Scoping Report provided stakeholders with an opportunity to verify that the issues they have raised through the process to date have been captured and adequately considered, and provides a further opportunity for additional key issues for consideration to be raised. This Final Scoping Report incorporated all issues and responses raised during the public review of the Draft Scoping Report prior to submission to DEA. The Final Scoping Report was accepted by DEA in March 2014 (refer to Appendix C). The additional information requested by DEA in the acceptance letter and the location of the requested information in this report has been included in this report in the following sections:

**Table 5.3:** DEA requirement and reference to Section in EIA Report

| DEA requirement for EIA | Section in report |
|---|---|
| Map indicating borehole positions | Refer to Figure 6.8 |
| Geology of the area | Refer to Section 6.6 |
| Type of aquifer | Refer to Section 6.8.2 |
| Hydrogeology on site | Refer to Section 6.8 |
| Current groundwater quality | Refer to Section 6.8.2 and Section 7.8.1 |

| DEA requirement for EIA | Section in report |
|---|---|
| Hydrocensus | Refer to Section 6.8.5 |
| Potential impacts of activities on surrounding groundwater users if any | Refer to Section 6.8.5 |
| Groundwater monitoring plan | Plan in place, to be extended. Section 7.8.1 |
| Historical groundwater monitoring data | Specialist study – Appendix I |
| Design drawings done by professional engineer | Refer to Appendix A |
| Specification of liner | To be designed in accordance with Regulation 636 of August 2013 published in terms of the Waste Act |
| Storm water management | Storm water management plan to be included as part of the Water Use License Application. Generic stormwater management measures considered in this report |
| The total footprint of the proposed development. Exact locations should be mapped at an appropriate scale | Approximately 25ha – Refer to Section 3 and Appendix A |
| Possible impacts and effects on vegetation and ecology | Refer to Section 7.4 and ecological specialist report |
| Possible impacts and effects on surrounding industrial area | Refer to Section 8 – cumulative impacts |
| Economic viability of the facility and how the surrounding area and local economy will benefit | Refer to Section 7.14 and social specialist report |
| Information on services required on site including sewage, refuse removal, water and electricity | Refer to Section 3 |
| Construction and operational phase EMP | Refer to Appendix P |

## 5.3. EIA Phase

The EIA Phase for the proposed project aims to achieve the following:

» Provide a comprehensive assessment of the social and biophysical environments affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed project.

» Comparatively assess any feasible alternatives proposed.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative impacts (both positive and negative) associated with all phases of the project including pre-construction, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

### *5.3.1. Tasks completed during the EIA Phase*

The EIA Phase for the proposed Transalloys Power Station and associated infrastructure has been undertaken in accordance with the EIA Regulations published in GN 33306 of 18 June 2010, in terms of NEMA. Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public participation process throughout the EIA process in accordance with Regulation 54 of GN R543 of 2010 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.

### *5.3.2 Authority Consultation*

The National DEA is the competent authority for this application. A record of all authority consultation undertaken is included within this EIA report. Consultation with the regulating authorities (i.e. DEA and Mpumalanga DEDET) has continued throughout the EIA process.

The following will be undertaken as part of this EIA process:

» Submission of a final EIA Report to DEA following a public review period for the draft EIA (40 days).
» Notification and Consultation with Organs of State that may have jurisdiction over the project, including provincial and local government departments, and State Owned Enterprises (such as Eskom, SANRAL, etc.).
» Provide an opportunity for DEA and MDEDET representatives to visit and inspect the proposed site, and the study area.

Correspondence with the following authorities (non DEA) with regard to the proposed project has occurred thus far:

» Meeting with Nkangala District Municipality as administrator of the Atmospheric Emissions License application.
» Pre-application consultation meeting with the Department of Water Affairs (Bronkhorstpruit office) as administrator of the Water Use License Application.
» Correspondence with DWA officials (Water Resource Protection) concerning development over a section of wetland on the site.

A record of the authority consultation in the EIA process is included within **Appendix C**.

### *5.3.3. Public Involvement and Consultation*

The public participation process has been undertaken in accordance with the requirements of Chapter 6 of the EIA Regulations of June 2010. The aim of the public participation process is primarily to ensure that:

» Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.
» Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.
» Comments received from stakeholders and I&APs were recorded and incorporated into the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities for stakeholders and I&APs to be involved in the EIA Phase of the process were provided, as follows:

» Opportunity for review of the draft EIA Report for a 40-day period from **30 March 2015 – 14 May 2015.** The comments received from I&APs during

this period have been captured within a Comments and Response Report, for consideration by the decision-making authority.

» Pre-arranged public meeting during the Draft EIA Report review period held on 6 May 2015.
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant).
» Written, faxed or e-mail correspondence.

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into a Comments and Response Report. The Comments and Response Report includes responses from members of the EIA project team and/or the project proponent. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided.

Public participation documentation from the process is included in Appendix D.

### *5.3.4. Assessment of Issues Identified through the EIA Process*

Issues which require investigation within the EIA Phase, as well as the specialists involved in the assessment of these impacts are indicated in Table 5.1 below.

**Table 5.3:** Specialist studies undertaken within the EIA Phase

| Specialist | Area of Expertise | Refer Appendix |
|---|---|---|
| Gerhard Botha with peer review by Marianne Strohbach | Ecology | Appendix E |
| Johann Lanz | Soils and agricultural potential | Appendix F |
| M2 Environmental Connections | Hydrology and Aquatic Bio-Monitoring | Appendix G |
| M2 Environmental Connections | Wetlands | Appendix H |
| Jones and Wagener | Geohydrology | Appendix I |
| Airshed Planning Professionals | Air Quality | Appendix J |
| Enviro Acoustic Research | Noise | Appendix K |
| MetroGIS | Visual | Appendix L |
| Heritage Contracts and Archaeological Consulting CC | Heritage | Appendix M |
| Malani Padayachee & Associates | Traffic | Appendix N |
| Tony Barbour | Social | Appendix O |

Specialist studies considered direct, indirect, cumulative, and residual environmental impacts associated with the development of the proposed project. Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
  - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
  - Medium-term (5–15 years) – assigned a score of 3
  - Long term (> 15 years) - assigned a score of 4
  - Permanent - assigned a score of 5
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment
  - 2 is minor and will not result in an impact on processes
  - 4 is low and will cause a slight impact on processes
  - 6 is moderate and will result in processes continuing but in a modified way
  - 8 is high (processes are altered to the extent that they temporarily cease)
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
  - Assigned a score of 2 is improbable (some possibility, but low likelihood)
  - Assigned a score of 3 is probable (distinct possibility)
  - Assigned a score of 4 is highly probable (most likely)
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
- The **status**, which is described as either positive, negative or neutral
- The degree to which the impact can be reversed
- The degree to which the impact may cause irreplaceable loss of resources

» The degree to which the impact can be mitigated

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M) P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A draft EMPr is included as **Appendix P**.

### *5.3.5. Assumptions and Limitations*

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site identified by the developer and his engineers now represents a technically suitable site for the establishment of the proposed power station.
» Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices E – O** for specialist study specific limitations.

## 5.4. Legislation, Policies and Guidelines which have informed the EIA Process

The following legislation and guidelines have informed the scope and content of this EIA Report:

- National Environmental Management Act (Act No 107 of 1998).
- EIA Regulations, published under Chapter 5 of the NEMA (GNR543, GNR544, GNR545, and GNR546 in Government Gazette 33306 of 18 June 2010).
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
  - Public Participation in the EIA Process (DEA, 2010).
- International guidelines – the Equator Principles and IFC Performance Standards (including Environmental, Health and Safety Guidelines for Thermal Power Plants).

Several other Acts, Standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in the **Table 5.4.**

**Table 5.4:** Relevant legislative permitting requirements applicable to the proposed Transalloys Power Station

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| **National Legislation** | | | |
| National Environmental Management Act (Act No 107 of 1998) | The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations.<br><br>In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.<br><br>In terms of GN R543, R544, R545 and R546 of 18 June 2010, a Scoping and EIA Process is required to be undertaken for the proposed project. | Department of Environmental Affairs – competent authority<br><br>Mpumalanga DEDET - commenting authority | The listed activities triggered by the proposed project have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA).<br><br>This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation. |
| National Environmental Management Act (Act No 107 of 1998) | In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised.<br><br>In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts. | Department of Environmental Affairs | While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project. |
| Environment Conservation Act (Act No 73 of 1989) | National Noise Control Regulations (GN R154 dated 10 January 1992) | Department of Environmental Affairs | Noise impacts are expected to be associated with the construction |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| | | Mpumalanga DEDET<br><br>Local Authorities | phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation. |
| National Water Act (Act No 36 of 1998) | Water uses under S21 of the Act must be licensed, unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is required).<br><br>Consumptive water uses may include the taking of water from a water resource and storage - Sections 21a and b, however these are not anticipated.<br><br>Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a watercourse - Section 21i. | Department of Water and Sanitation | The following Section 21 water uses have been identified for the proposed project, in terms of which a Water Use License will be required:<br>» 21(b) storing water;<br>» 21(c) impeding or diverting the flow of water in a watercourse;<br>» 21(g) disposing of waste in a manner which may detrimentally impact on a water resource;<br>» 21(i) altering the bed, banks, course or characteristics of a watercourse |
| Minerals and Petroleum Resources Development Act (Act No 28 of 2002) | A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.<br><br>Requirements for Environmental Management Programmes and Environmental Management Plans | Department of Mineral Resources | As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.<br><br>Anglo Coal has mining rights over sections of land owned by |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| | are set out in S39 of the Act.<br><br>S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site. | | Transalloys. A Section 53 application is required to be submitted to the DMR for the proposed development area. No objections to the siting of the proposed project components within the mining right area (i.e. sites 1 and 2) were received based on discussions with Anglo Coal. |
| National Environmental Management: Air Quality Act (Act No 39 of 2004) | S21 – Listed activities requiring an Air Emissions License.<br><br>Minimum emission standards are set for Listed Activities. The minimum emission standards are defined for existing and new plants in Government Notice 893 of 22 November 2013.<br><br>Measures in respect of dust control (S32) and National Dust Control Regulations of November 2013.<br><br>Measures to control noise (S34) - no regulations promulgated yet.<br><br>The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act. | Department of Environmental Affairs | Solid fuel combustion installations using solid fuel for electricity generation are Listed Activities (Category 1: Sub-category 1.1) in term of Section 21 of the NEM:AQA. Therefore an Air Emissions License must be obtained for the project.<br><br>Measures in respect of dust control (S32) and the National Dust Control Regulations of November 2013. |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| National Heritage Resources Act (Act No 25 of 1999) | » Stipulates assessment criteria and categories of heritage resources according to their significance (S7).<br>» Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35).<br>» Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36).<br>» Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38).<br>» Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44). | South African Heritage Resources Agency | An HIA has been undertaken as part of the EIA Process to identify heritage sites (refer to Appendix M). Should a heritage resource be impacted upon, a permit may be required from SAHRA. |
| National Environmental Management: Biodiversity Act (Act No 10 of 2004) | » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53)<br>» A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657.<br>» Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable | Department of Environmental Affairs | Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.<br><br>An ecological study has been undertaken as part of the EIA Phase. As such the potentially occurrence of critically |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| | and protected species) and GN R 152 (Threatened or Protected Species Regulations).<br>» Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011).<br>» This Act also regulates alien and invader species. | | endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered. This report is contained in Appendix E. |
| Conservation of Agricultural Resources Act (Act No 43 of 1983) | » Prohibition of the spreading of weeds (S5)<br>» Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur.<br>» Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048). | Department of Agriculture | This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.<br><br>The permission of agricultural |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| | | | authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. The siting of the ash disposal facility could potentially require such consent. |
| National Forests Act (Act No. 84 of 1998) | According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'. | National Department of Forestry | A licence is required for the removal of protected trees. The presence of protected trees on the site was determined through the ecological impact assessment undertaken for the project (refer to Appendix E) |
| National Veld and Forest Fire Act (Act 101 of 1998) | In terms of S21 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material.<br><br>In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires. | Department of Agriculture, Forestry and Fisheries (DAFF) | While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project. |
| Hazardous Substances Act (Act No 15 of 1973) | This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of | Department of Health | It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| | certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.<br><br>Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance<br>Group IV: any electronic product; and<br>Group V: any radioactive material.<br>The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force. | | handled. If applicable, a license is required to be obtained from the Department of Health. |
| Development Facilitation Act (Act No 67 of 1995) | Provides for the overall framework and administrative structures for planning throughout the Republic.<br><br>S (2-4) provide general principles for land development and conflict resolution. | Local Municipality | The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act. |
| National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) | The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. | National Department of Water and Environmental Affairs (hazardous waste) | A waste license is required for the disposal of waste to land (ash) and for the construction of the ash disposal facility associated with the |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| | The Minister may amend the list by –<br>» Adding other waste management activities to the list.<br>» Removing waste management activities from the list.<br>» Making other changes to the particulars on the list.<br><br>In terms of the Regulations published in terms of this Act (GN 912), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities.<br><br>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:<br><br>» The containers in which any waste is stored, are intact and not corroded or in<br>» any other way rendered unlit for the safe storage of waste.<br>» Adequate measures are taken to prevent accidental spillage or leaking.<br>» The waste cannot be blown away.<br>» Nuisances such as odour, visual impacts and breeding of vectors do not arise; and<br>» Pollution of the environment and harm to health are prevented. | Provincial Department of Environmental Affairs (general waste) | power station.<br><br>General waste handling, storage and disposal during construction and operation is required to be undertaken. The DWAF (1998) Waste Management Series: Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste will also need to be considered. |
| Subdivision of Agricultural Land Act | Details land subdivision requirements and | Department of | Subdivision of land may be |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| (Act No 70 of 1970) | procedures. Applies for subdivision of all agricultural land in the country | Agriculture | required in terms of S24 and S17 of the Act. |
| National Road Traffic Act (Act No 93 of 1996) | » The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.<br>» Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.<br>» The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations. | » South African National Roads Agency Limited (national roads)<br>» Provincial Department of Transport | An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width). |
| **Provincial Legislation** | | | |
| Mpumalanga Nature Conservation Act 10 of 1998 | This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild | Mpumalanga Department of Economic Development, | A collection/destruction permit must be obtained from MDEDET for the removal of any protected plant or animal species found on |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|---|---|
| | Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:<br>» Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property;<br>» Aquatic habitats may not be destroyed or damaged;<br>» The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.<br><br>The Act provides lists of protected species for the Province. | Environment and Tourism | site. Additionally, a permit for the disturbance or destruction of indigenous species must be applied for. |
| Mpumalanga Biodiversity Conservation Plan | The MBCP builds on other national plans at the provincial level in Mpumalanga. It is intended to be used by all who are involved in land-use and development planning, most particularly those specialists who need a comprehensive source of biodiversity information. It denotes areas of importance in terms of terrestrial and aquatic biodiversity as well as protected areas. | Mpumalanga Tourism and Parks Authority | The proposed project is not situated within any protected areas, areas of terrestrial or aquatic significance. |

## 5.5. Existing environmental consents

Transalloys is required to be environmentally compliant in terms of the following environmental approvals specific to the existing industrial operations:

- » Water Use License (dated 05/2011)
- » Waste Management License (dated 10/2011)
- » Atmospheric Pollution Prevention Act (APPA) Certificate (dated 03/2010)

Transalloys is included in the list of industries operating in the HPA who have provided an emission reduction plan, indicating the air quality improvements that would be undertaken as part of fulfilling the "duty of care "principle (source: Highveld Priority Area Air Quality Management Plan).

# DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 6

This section of the report provides a description of the environment that may be affected by the proposed power station and associated infrastructure at the Transalloys Siliconmanganese smelter facility. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as field data, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist reports contained within Appendices E - O.

## 6.1 Location of the Study Area and Site

The Transalloys Siliconmanganese smelter facility is situated approximately 9km west of eMalahleni (formerly Witbank), south of the N4 highway and north of Clewer, in the eMalahleni Local Municipality within the greater Nkangala District Municipality of the Mpumalanga Province. The Transalloys smelter complex is situated on Portions of the Farm Elandsfontein 309 JS and portions of the Farm Schoongezicht 308 JS. Access to Transalloys is facilitated via the R547 (Bailey Avenue).

The towns of Clewer, Kwa-Guqa and eMpumelelweni represent the populated places within the study area, at distances ranging from approximately 1km, 3km and 3.5km respectively.

## 6.2 Character of the Surrounding Region

The proposed power station site is situated adjacent to the slag dumps and other related infrastructure of the Transalloys smelter complex. Transalloys is situated within 1km south-east of Evraz Highveld Steel and Vanadium, which is a producer of steel and vanadium products. The Anglo Coal Landau Colliery is situated within 5km to the south-east. Anglo Coal has a converted old order Mining Right over areas to the east and including portions of land owned by Transalloys. Mining on many of the areas encompassed in the mining right area is proposed to commence before 2020. Other power stations within the region include the soon to be operational Eskom Kusile Power Station situated less than 20km to the west and the Eskom Duvha Power Station within 22km to the south-east.

## 6.3 Land Use

The region has a strong mining and industrial character, interspersed with agricultural activities (maize crop production) and human settlements. The central and south-eastern parts of the study area are home to a number of coal mines and industrial plants. These activities, especially the expansive mining and quarrying, are rapidly changing the once rural and agricultural character to that of a predominantly industrial nature. Industrial and mining activities in close proximity to the Transalloys smelter complex include the EVRAZ Highveld Steel works to the north-west and the Landau colliery to the south-east. The southern part of the study area still has a largely agricultural and rural character where predominantly dryland agriculture (maize) and limited irrigated agriculture are practised.

Figure 6.1 shows the location of the proposed project relative to other land uses in the region.

### *6.3.1 Human settlement*

North of the N4 national road the land use activities are dominated by the KwaGuqa town. This town and expanded town lands primarily include formalised high density settlements with some informal township developments along the outskirts. Other than the above town, Ackerville, Lynnville and eMalahleni to the east, and smaller residential areas to the south are generally associated with the mining activities, where employees of these mines are housed, particularly in Clewer, a small town and small holdings, situated south of the Transalloys smelter complex.

Farm settlements or residences occur to the south of the study area. Some of these include: Allandale, Weltevrede, Hartebeestalaagte and Elandsfontein. The population density of the region is indicated at approximately 100 people per $km^2$, predominantly concentrated within the towns of eMalahleni and Kwa-Guqa.

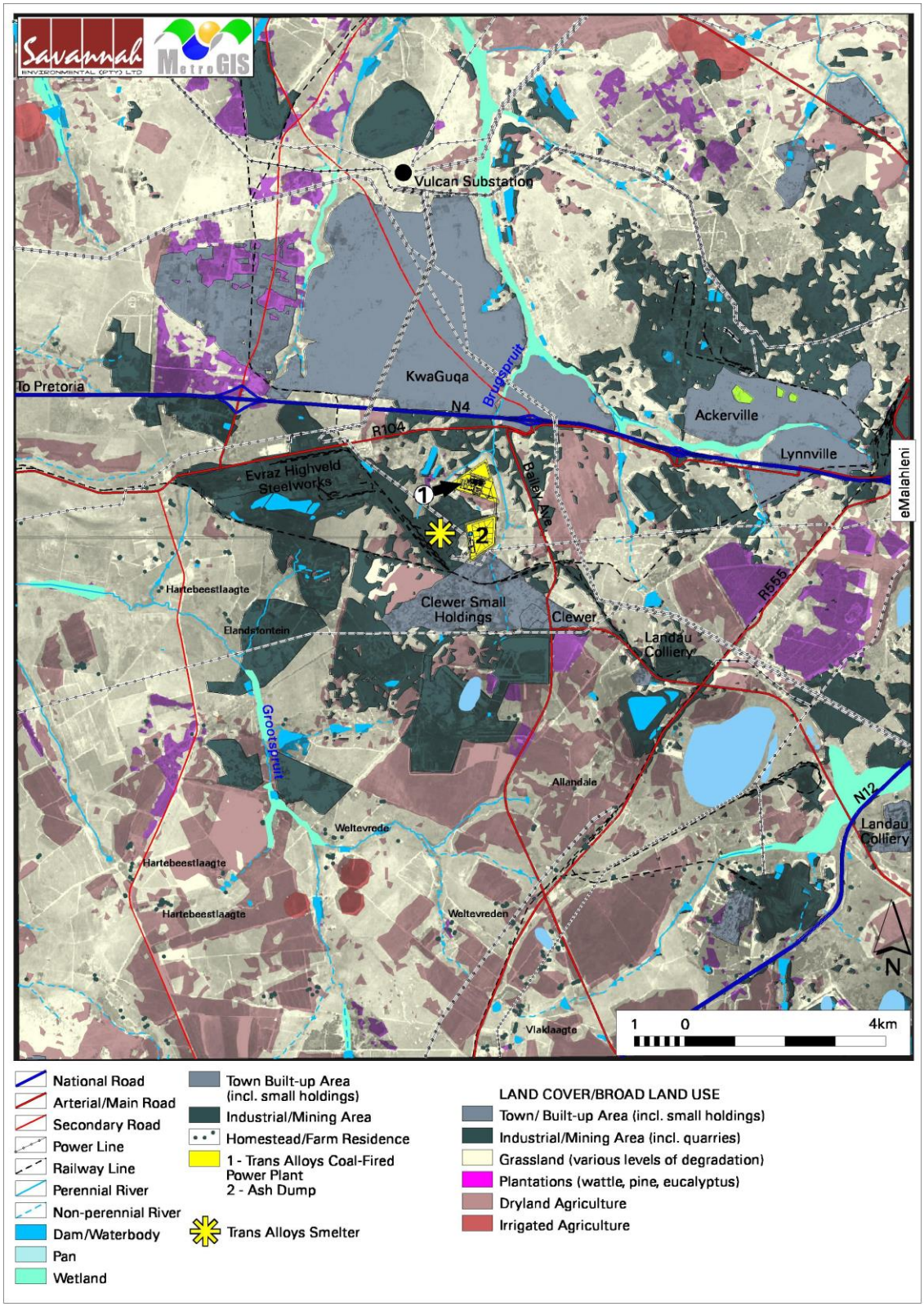



**Figure 6.1:** Land cover / land use map

### *6.3.2 Infrastructure*

A host of power lines traverse the project area and nearby surrounding areas, many of them originating at the power stations within the region, or congregating at the Vulcan substation north of Kwa-Guqa. Electricity for the EVRAZ Highveld steel works and Transalloys plant are supplied by some of these power lines. Additional linear infrastructure includes the railway line and railway sidings traversing west of the Transalloys plant, transporting iron ore to the EVRAZ Highveld steel works.

### *6.3.3 Mining expansion and prospecting*

Anglo American Coal South Africa has mining rights throughout much of the study area (refer to Figure 6.2). Anglo Coal is currently applying to expand open-cast mining activities as part of the Landau Colliery Life Extension Project, extending east of Baily Avenue near Transalloys and towards the N4 national road, encompassing portions of land owned by Transalloys. This application is in the Environmental Impact Assessment phase and has not been concluded as yet. Coal pits proposed to be opened by Anglo as part of the life extension project are situated to the east of the Brugspruit over power plant site alternative 3 (refer to Section 4.1.2). Furthermore site alternative 4 is situated within the Landau Colliery Navigation Section mine boundary area, but adjacent / very near to the proposed Landau Colliery Life Extension Project.

To the west of Transalloys (on site alternative 5) mine exploration applications and mining rights are being sought by two separate mining companies.

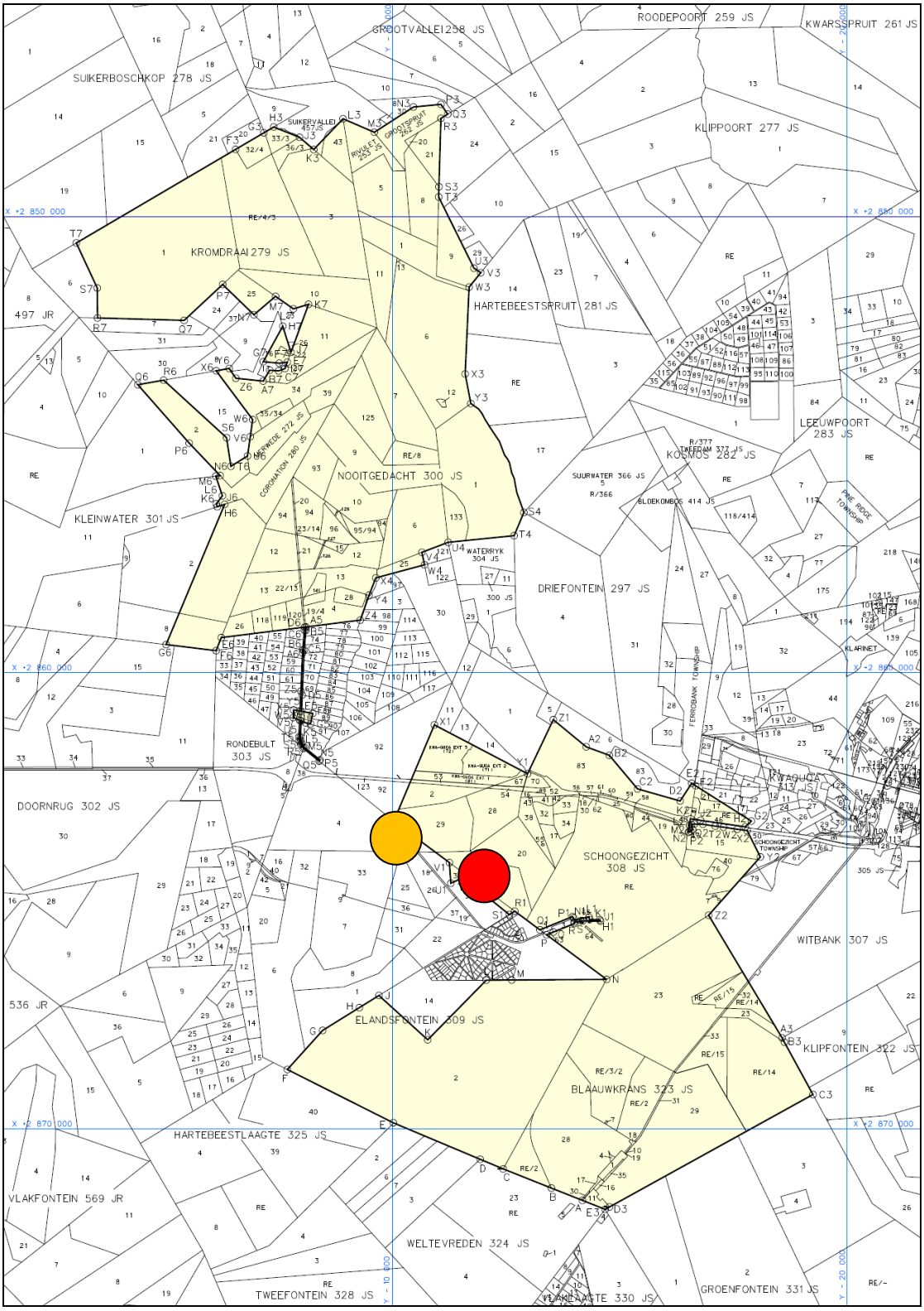



**Figure 6.2:** Anglo Coal Surface Title Plan (yellow shaded areas) relative to Transalloys (red circle) and Highveld Steel (orange circle) (Source: AngloAmerican)

## 6.4 Climate

The climate for Transalloys has been derived from climatic data summarised for eMalahleni (refer to Figure 6.3). The area receives on between 540mm and 650 mm of rain per year. From May to September, rainfall is minimal, with most rainfall occurring from November to March, peaking between November and January. The warmest month is January with daily average temperatures rising from 13.4 °C to 26.9 °C. In July, the average temperature at night drops to 5.6°C, and rises to 21.8 °C during the day. Frosts are common during winter, generally occurring from mid-April to late September.

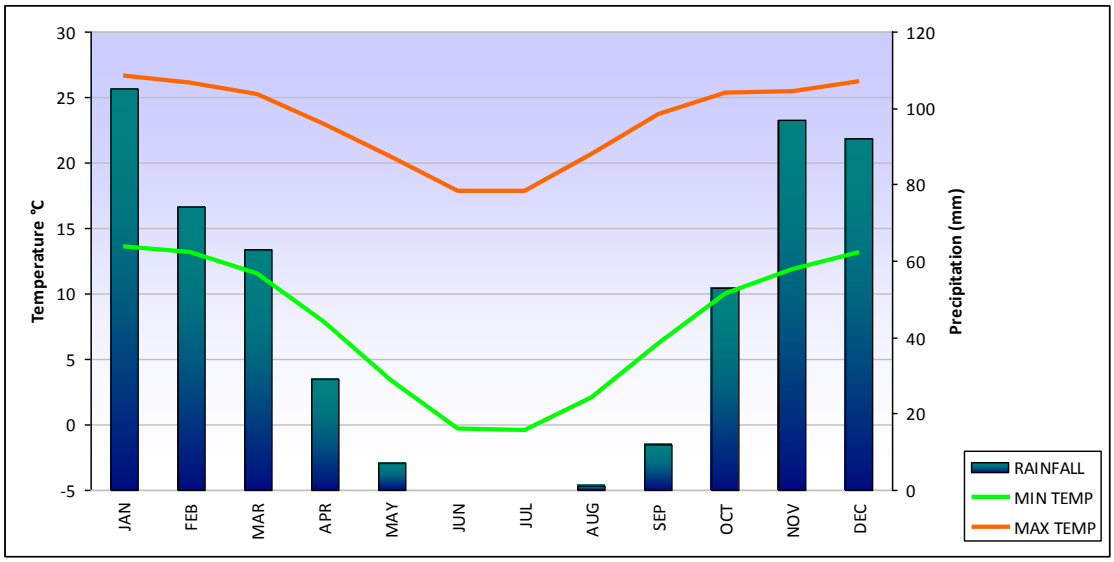



**Figure 6.3:** Climate data for eMalahleni as summarised from available sources.

## 6.5 Topography

The topography of the region is broadly described as Moderately Undulating Plains and Pans of the Central Interior Plain. Within the study area the surface water drainage is towards the east, into the Brugspruit. The topography is undulating and gently slopes towards the Brugspruit. The proposed power station site is located within a terrain unit of level plains with some relief at an altitude of between 1 490 and 1 540 meters above sea level. The project site has an average slope of 4% with an aspect from north east to south east.

## 6.6 Geology

The regional geology in the area is characterised by the sedimentary rocks of the Karoo Supergroup, in particular the Dwyka and Ecca Groups. The Dwyka consists mainly of tillite and diamictite, whereas the Ecca consists of siltstone, shale and sandstone belonging to the Vryheid Formation. The Dwyka sediments were

deposited during late Carboniferous to early Permian times by glacial processes and the underlying rocks particularly in the north, display well-developed striated glacial pavements in places. The group consists mainly of diamictite (tillite), which is generally massive with little jointing, but it may be stratified in places. The major geological formations of the region, relative to the project site are illustrated in Figure 6.4.

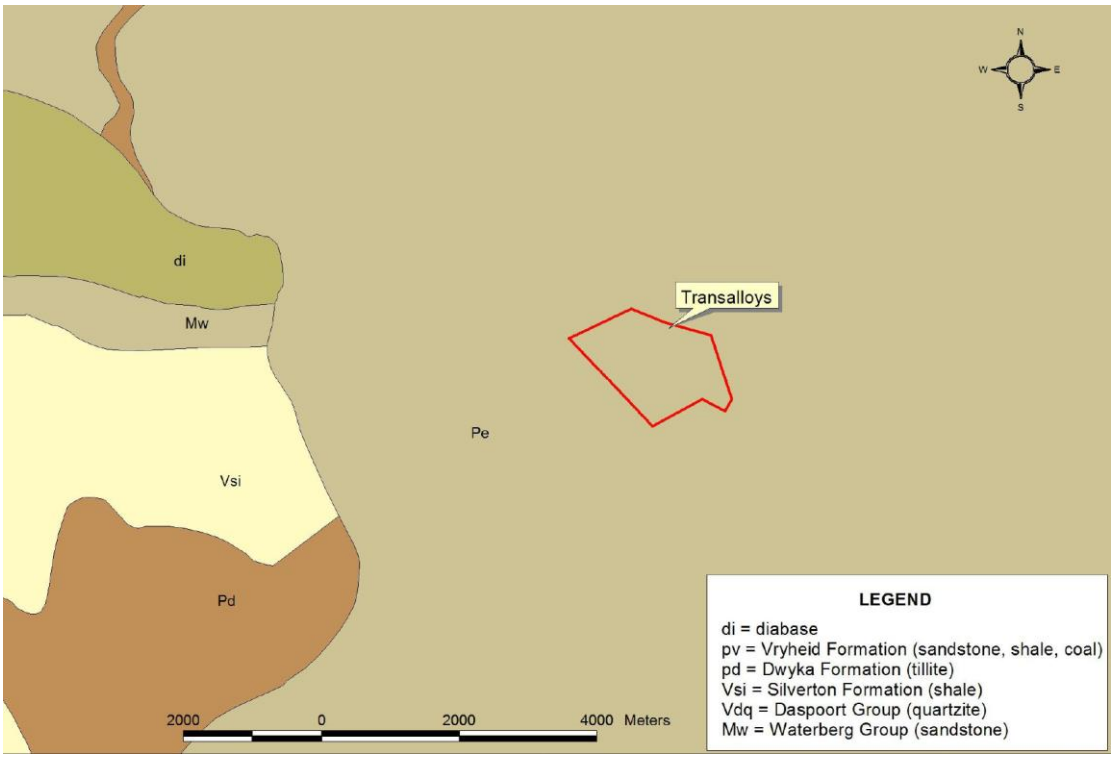



**Figure 6.4:** Map of the bedrock geology underlying the project area

## 6.7 Surface Water

### *6.7.1 Catchments*

Transalloys and the proposed power station project site (and its alternative sites) are located within Quaternary Catchment B11K. According to the approved reserve for the various river ecosystems in the Upper Olifants, Wilge and Olifants-Loskop catchments, dated 2010 (DWA, 2010b), the Present Ecological State (PES) of the rivers within the B11 catchment are generally in an E ecological category which represents a seriously modified system where there has been a great or extensive loss of natural habitat, biota and basic ecosystem functions. As a result, the riparian vegetation is disrupted by the dominance of exotic fauna and flora and few fish species present. The Water Management Areas and position in relation to freshwater priority areas is illustrated in Figures 6.5 and 6.6 respectively.

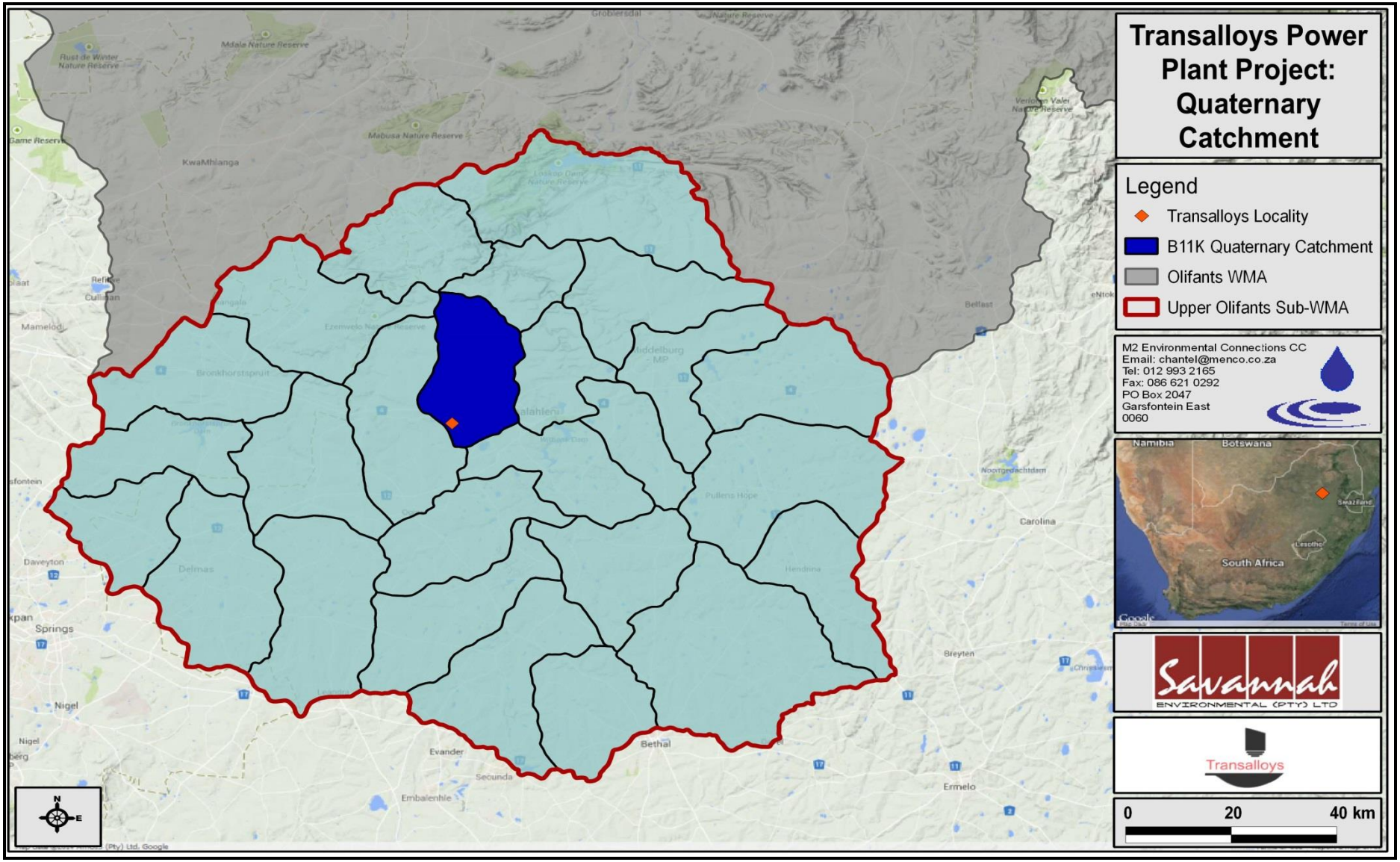



**Figure 6.5**: Delineation of the Water Management Area

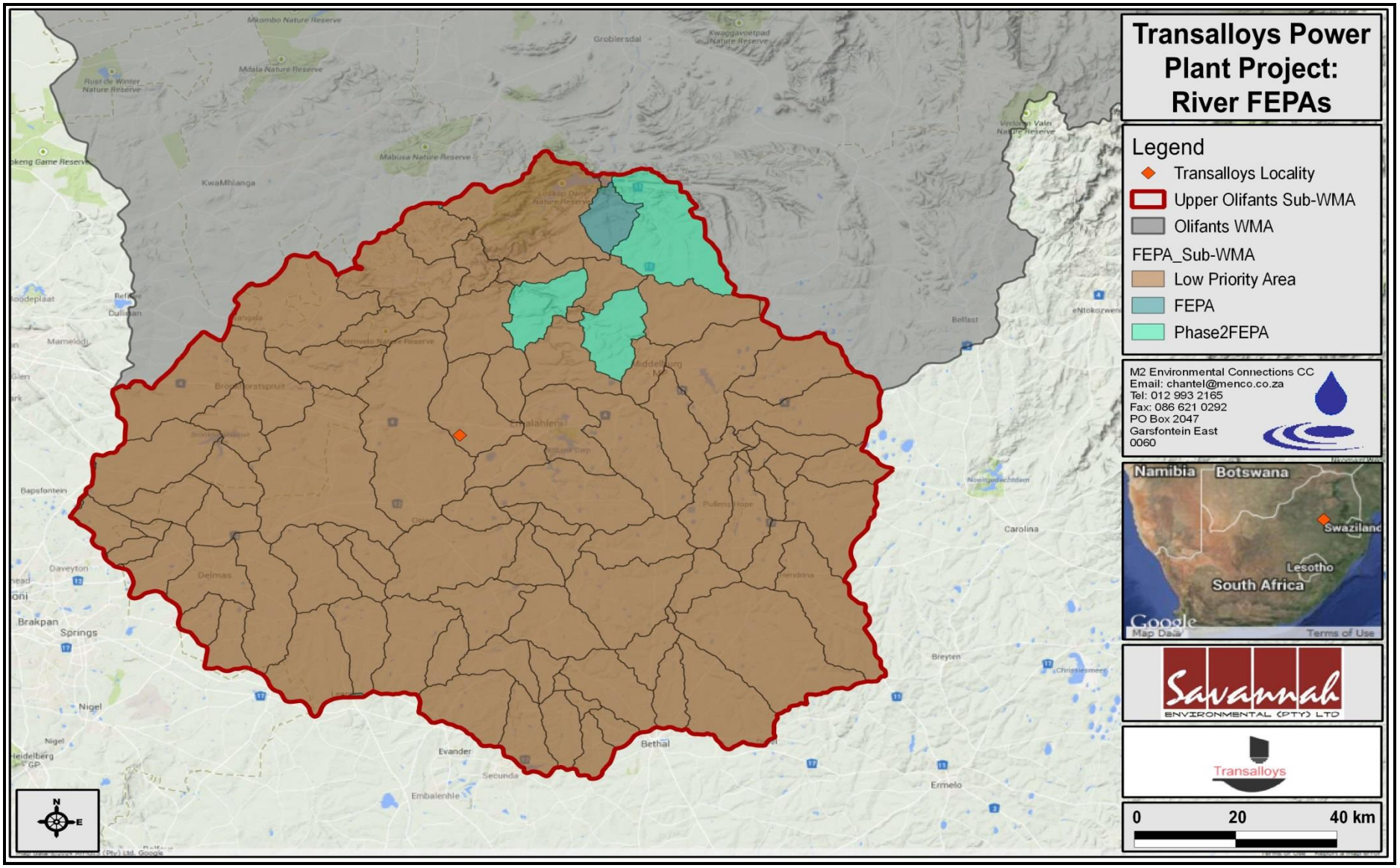



**Figure 6.6:** Location of the Transalloys project site in relation to the freshwater Ecosystems Priority regions

### *6.7.2 Watercourses*

The identified water resources, within close proximity to the project site include the Brugspruit to the east of the project site and an unnamed western tributary of the Brugspruit found to the north-west of the proposed power plant. The Brugspruit is a tributary of the Klipspruit north of the project site which conjoins with the Klip River in a northerly direction to ultimately feed into the Olifants River. Surface water features in the study area are indicated in Figure 6.7.

### *6.7.3 Wetlands*

Five wetlands of the Channelled Valley bottom and hillslope seepage variety were delineated within the study area, four of which are in near proximity to the project site:

» Wetland 1 (Klipspruit and Brugspruit Confluence) – located in excess of 1km downstream of the project site.
» Wetland 2 (Brugspruit upstream) – An un-channelled valley bottom wetland (degraded system) including both natural and artificial flows from adjacent slag dumps which has substantially added to the size and shape of the original natural wetland.
» Wetland 3 (Brugspruit confluence) – this wetland is located to the north of the proposed power plant and is considered to be the most important wetland in the study area due to its water quality regulation function (toxicant and phosphate removal).
» Wetland 4 (Brugspruit at existing bridge)
» Wetland 5 (Brugspruit upstream) – this wetland is situated to the north of Clewer on Transalloys property.

Wetlands 2 and 5 represent the most degraded wetland systems within the study area. The Present Ecological Status (PES) and Ecological Importance and Sensitivity (EIS) of the identified wetland systems in determining their relative importance is considered in Section 7.5 (Impact Assessment). Wetlands delineated in the study area are indicated in Figure 6.7.

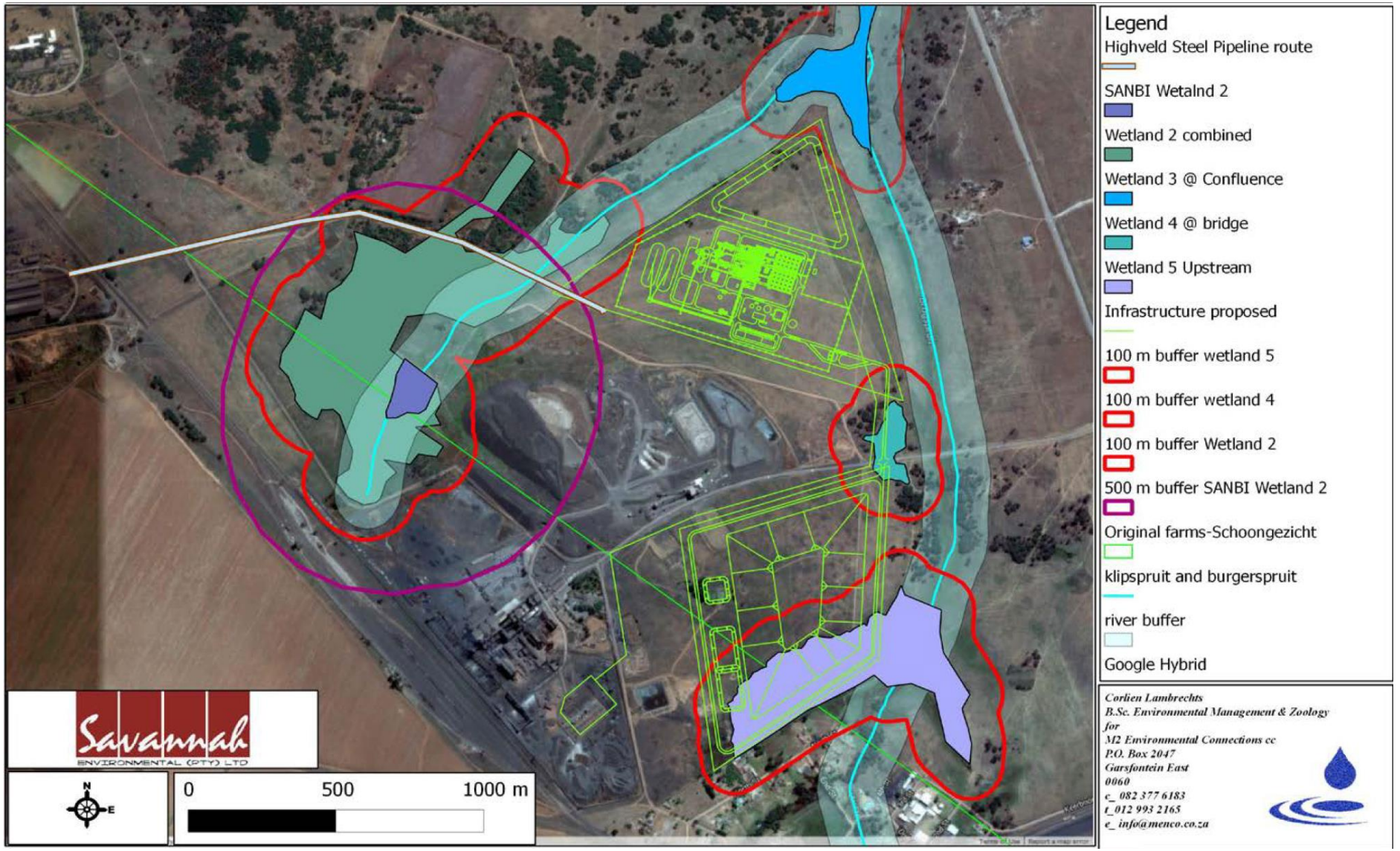



**Figure 6.7:** Surface water features and delineated wetland areas within the project area relative to the proposed power station and associated infrastructure (150 MW option only)

### *6.7.4 Surface water quality and aquatic health*

During 2005, Clean Stream Biological Services (CSBS) identified biomonitoring sites that would allow for the assessment of the potential impact of Transalloys' current activities on the biotic integrity of their receiving water bodies as part of a long term biomonitoring programme. Two biomonitoring sites were identified upstream and downstream of Transalloys in the eastern tributary while one biomonitoring site was identified in the western tributary of the Brugspruit. These biomonitoring sites and additional sites were surveyed by Koekemoer Aquatic Services during 2012 and 2013. A further study was conducted in 2014 by M2 Environmental Connections CC in which four biomonitoring sites were sampled.

The water quality results that exceeded the Resource Water Quality Objectives (RWQO) are alkalinity, Fluoride, Faecal Coliform, Bacteria, Aluminium, Manganese and Iron, of which the following are of slight concern:

» Faecal Coliform Bacteria: The impacts related to organic enrichment and sewage pollution into the Brugspruit from the Clewer settlement are severe. Organic enrichment is under normal situations not toxic to aquatic life, but rather results in changes in the biota community structure. The chemical changes are usually related to a decrease in Dissolved Oxygen that occurs as a result of an increase in the biological oxygen demand and also changes in nutrient levels. The physical changes are indicated by increased turbidity and suspended solids. This has an effect on the light penetration and thus primary production which decreases the amount of food available to organisms on higher trophic levels.
» Aluminium: The effects of Aluminium on the aquatic ecosystem are still intensely researched, but are mainly related to the interference in osmotic and ionic balances, together with respiratory problems in fish.
» Manganese: High levels of Manganese could interference with various metabolic pathways and result in disturbances in the central nervous system in vertebrates.

Anthropogenic activities occurring in the upper catchment of the Brugspruit have a cumulative impact on the aquatic system of this watercourse. The town of Clewer has a severe impact on the stream as a result of sewage effluent discharges and other chemicals and materials entering the stream (sources unknown and unconfirmed). Other impacts to aquatic health observed include:

» Increased storm water run-off and pollution due to urbanisation and industry located upstream of the bio-monitoring sites resulted in increased erosion and siltation of the aquatic ecosystem downstream from the impact areas.

» Industrial seepage/drainage and sewage runoff in the area has a negative impact on the water quality and aquatic systems.

Water quality did however show some improvement from the upstream monitoring site to the downstream monitoring site. This is an indication that the wetland system is of importance to the stream's aquatic ecology to some extent.

The overall status of the Brugspruit as monitored is classified to be in a Poor to Fair condition and the Ecological Importance and Sensitivity is considered as Marginal/low.

## 6.8. Groundwater

### *6.8.1 Regional geology*

The geology of the region is the controlling agent for aquifer development. The geology of the area is discussed in Section 6.6.

### *6.8.2. Aquifers*

The rock types in the study area can be divided into two distinct aquifers, namely a shallow weathered aquifer and a deeper fractured aquifer.

» *Shallow weathered aquifer*
The shallow weathered aquifer mainly comprises unconsolidated sand and clay. The depth of weathering, based on the geological borehole logs and some field investigations varies between 0m- 12m in depth. Recharge to this aquifer occurs from rainfall as well as from surface water sources, including the Transalloys waste disposal sites. Rainfall recharge to the aquifer is reportedly in the order of 3% of the mean annual precipitation (MAP). The characteristic shale layers in the Karoo lithology restrict the downward filtration of rainwater into the deeper formations. Groundwater therefore often accumulates on the contact between the weathered and fresh bedrock. The borehole yields in this aquifer are generally low due to the very low hydraulic conductivity of the aquifer material and the limited vertical extent of this aquifer. The groundwater quality in undisturbed areas is good due to the dynamic recharge from rainfall. This shallow aquifer is, however, more likely to be impacted by surface contamination.

» *Deeper fractured aquifer*
A deeper fractured aquifer is also present in the fresh shale, sandstone and coal seams underlying the weathered material. The primary porosity of the Ecca group rocks does not allow significant groundwater flow, except where

the porosity has been increased by subsequent secondary structures, such as faults and dykes. No dykes were, however, detected in the study area.

According to Hodgson and Krantz (1998), coal seams often show the highest hydraulic conductivity. Where developed, the fractured Karoo aquifer seldom constitutes an economic aquifer able to sustain excessive pumping and irrigation. The groundwater quality in the fractured aquifer is generally of a poorer quality than the weathered aquifer due to the concentration of salts. This may be attributed to a less dynamic system and a larger residence time of rainfall recharge within the aquifer.

### *6.8.3 Groundwater gradients*

Good correlations in the weathered and in the fractured aquifers are indicative of the fact that the groundwater gradient mimics the topography within the immediate vicinity of the study area. This is applicable to both the weathered and fractured horizons. Groundwater flow is perpendicular to the groundwater contours and is generally towards the watercourses. The average groundwater gradient in the weathered aquifer is 2.3% compared to the 2.4% in the fractured aquifer.

### *6.8.4 Borehole information*

18 boreholes from which groundwater data can be obtained exist around the Transalloys operations. The locality of the boreholes is indicated in Figure 6.8. A groundwater monitoring programme is currently undertaken by Transalloys.

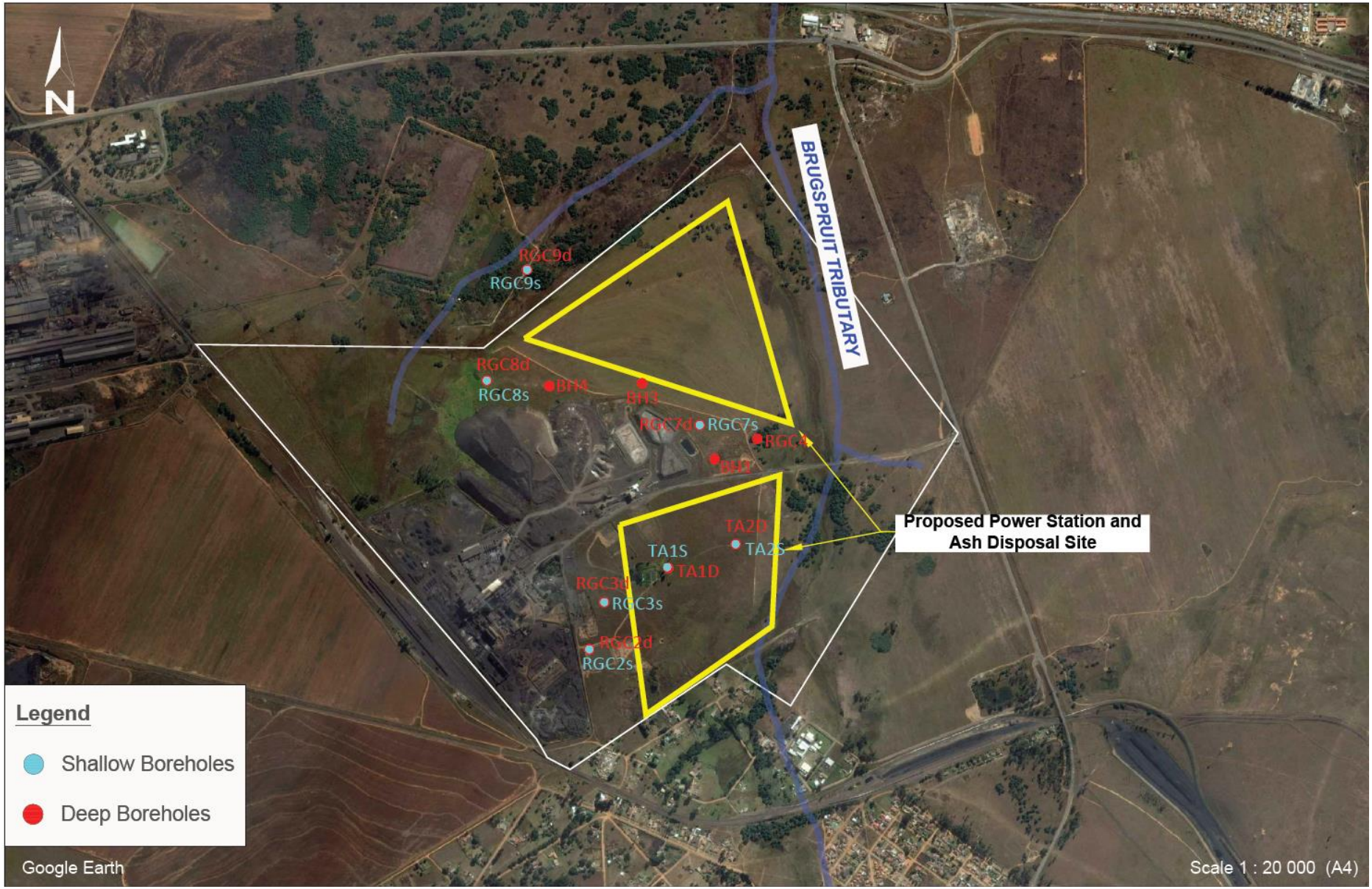



**Figure 6.8**: Existing borehole positions relative to the Transalloys operations and proposed development areas

### *6.8.5 Pathway and critical receptors*

The groundwater pathways in the aquifers in which the proposed project is situated are typically fractures, faults and bedding planes present in the rocks. The geological map and on-site geophysical investigations indicate that there are no dolerite dykes or sills within the project area. Logs from the monitoring boreholes confirm the presence of zones of higher permeability, which are mainly associated with the contact between the weathered aquifer and the underlying shale. Discrete fractures are also associated with increased permeability. These are associated with the contact between the coal and shale as well as with the sandstone.

Due to the groundwater table mimicking the topography, the critical receptors for the project area is the Brugspruit and its tributary. Available information suggests that no private groundwater use takes place between the Transalloys site and these rivers, which is where the construction of the proposed power plant and associated infrastructure is proposed to occur.

## 6.9. Vegetation

The study area is situated in the Grassland biome, and is covered by the Eastern Highveld Grassland (refer to Figure 6.9). This vegetation type has been listed in the threatened terrestrial ecosystems for South Africa (2011) as Vulnerable. Several different types of wetlands were identified on and around the study area during the wetland identification and delineation study. These wetlands resemble Eastern Temperate Freshwater Wetlands as classified by Mucina & Rutherford (2006) and are also listed in the threatened terrestrial ecosystems for South Africa (2011) as Vulnerable.

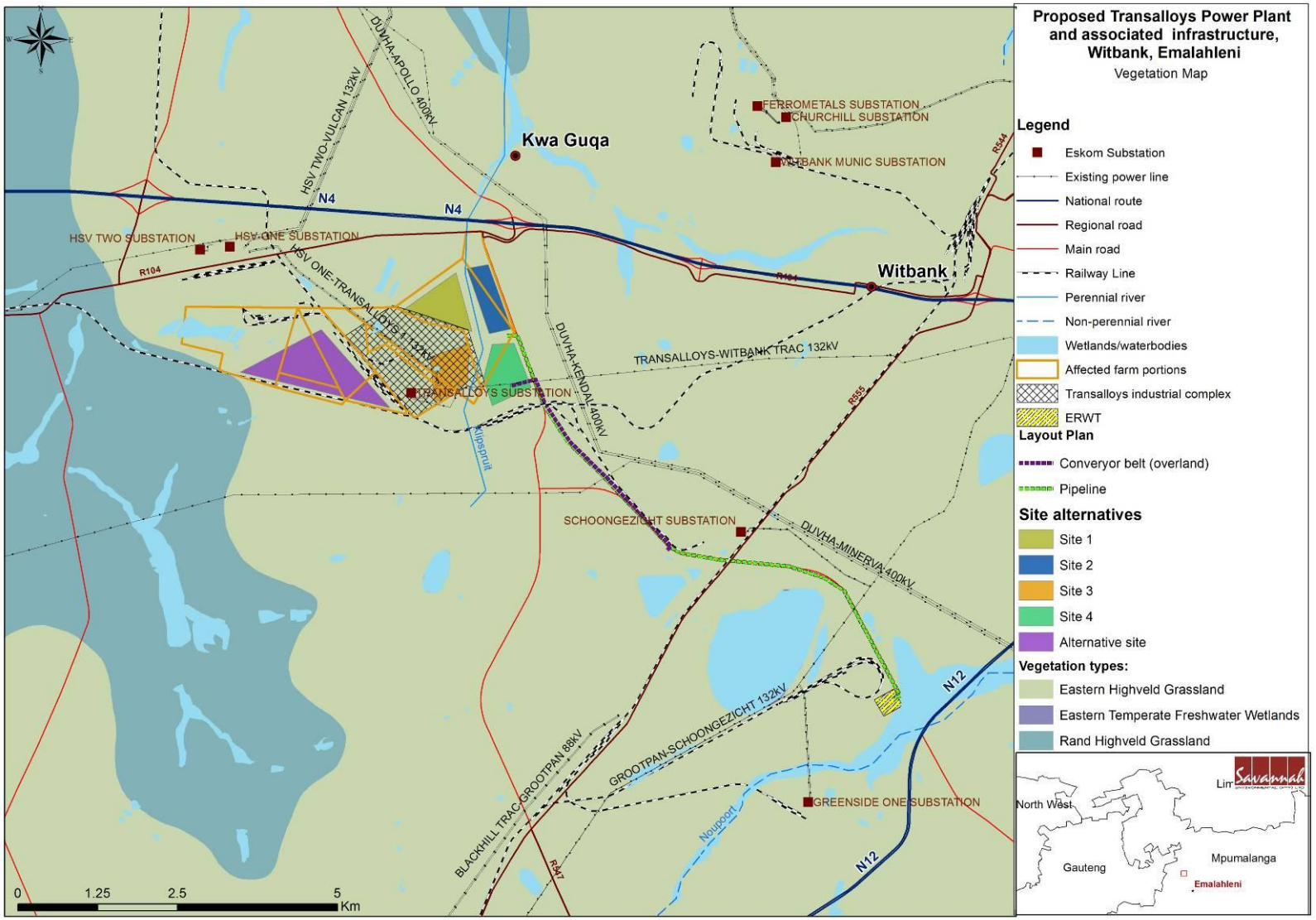



**Figure 6.9:** Vegetation Map for the Broader study Area

### *6.9.1. Broad Scale Mapping*

**Eastern Highveld Grasslands:** Eastern Highveld Grassland is situated on slightly too moderately undulating plains, dominated by short dense grasses of the genera *Aristida, Brachiaria, Cynodon, Digitaria, Eragrostis, Setaria, Sporobolus, Themeda* and *Tristachya*. Smaller rocky outcrops provide a niche habitat for more wiry grasses and few woody species, including *Acacia caffra, Celtis africana, Diospyros lycioides* subsp. *lycioides, Protea caffra, Searsia magalismontanum* etc. Similar specialised habitats are provided by pan depressions and seepage areas (Mucina and Rutherford 2006). The diversity of the herbaceous layer may vary significantly from year to year depending on rainfall amount and timing, which influence the germination of annuals and resprouting of species with woody below-ground rootstocks. Common herbs include *Berkheya setifera, Haplocarpha scaposa, Acalypha angustata, Dicoma anomala* and several *Helichrysum* and *Ipomoea* species.

**Eastern Temperate Freshwater Wetlands:** The topography and vegetation of the Eastern Temperate Freshwater Wetlands can be described as shallow depressions filled with seasonal or permanent water supporting hydrophyllous (water-loving) vegetation. Vegetation is usually dominated by *Cyperus* species, *Eragrostis plana, Eragrostis planiculmis, Imperata cylindrica, Paspalum* species and *Schoenoplectus* species. Specific species composition will depend on the level of inundation within the different zones of the wetland (Mucina & Rutherford, 2006).

### *6.9.2 Fine Scale Mapping*

The majority of the area has been severely transformed and degraded with little of the original vegetation character (for both Eastern Highveld Grassland and Eastern Temperate Freshwater Wetlands) still present. Transformation on the project site has occurred as a result of a number of activities including historical cultivation practices, industrial and mining activities, the construction of a number of settling ponds and small dams, the presence of numerous smaller roads (access, gravel and twin track roads) etc. The natural veld and wetlands have furthermore been severely degraded due to overgrazing and trampling (cattle and goats from adjacent township) and the invasion of large numbers of alien plants, especially large stands of *Acacia dealbata*.

Four vegetation units (refer to Figure 6.10) were identified in the broader study area (over all site alternatives considered), namely:

» Vegetation Unit 1 (*Typha capensis – Phragmites australis*)
» Vegetation Unit 2 (*Eragrostis plana – Agrostis montevidensis*)
» Vegetation Unit 3 (*Hyparrhenia hirta – Eragrostis chloromelas*)

» Vegetation Unit 4 (*Indigofera melanandenia – Aristida junciformis*)

Vegetation Units 1 and 2 are associated with the wetland valley bottom and hillslope seepage wetlands (Unit 1 with the deeper main channels of the valley bottom wetlands and Unit 2 with the shallower permanent wet and seasonal zones of the valley bottom wetlands and hillslope seeps). Units 3 and 4 are associated with the terrestrial vegetation (Unit 3 with the rocky outcroppings and areas with shallow gravelly soils and Unit 4 with the deeper soils). The main environmental features determining the occurrence and distribution of these units are soil moisture, soil texture and depth.

Vegetation Units occurring over the project site consist predominantly of Vegetation Unit 3, with Vegetation Unit 2 also occurring in the south eastern section of the planned ash disposal facility. These vegetation units are further described below.

**Vegetation Unit 2:** The key ecological influences in this unit are the seasonally to temporary saturated condition of the soils. This unit has the highest species diversity containing approximately 56 different species. Vegetation Unit 2 is dominated by moisture loving grass species and especially dominant is Agrostis montevidensis, *Eragrostis plana, E. micrantha, Imperata cylindrica, Paspalum urvillei, P. dilatatum, Ischaemum fasciculatum* and *Cynodon dactylon.* Although not as dominant as the grass species, in terms of species diversity, the few sedges found in this unit play and important role in the functioning of the wetlands. *Cyperus longus, C. denudatus* and *Kyllinga erecta* are the three most abundant cyperoid species found in the study area.

Vegetation Unit 2 on the site is in a largely transformed and degraded state. A number weeds and invasive alien species have invaded these parts of the wetlands with no more than 14 different species of weeds and aliens present, contributing almost 24% of the total species composition of Vegetation Unit 2. Of the 14 species, 3 are Category 1 invasive aliens (*Cirsium vulgare*, *Campuloclinium macrocephalum* and *Acacia dealbata*) and 2 are Category 2 invasive aliens (*Nasturtium officinale*, *Eucalyptus grandis*). The exotic grass species *Agrostis montevidensis* has invaded extensive areas of the wetlands. Within the more prolonged wet zones of this unit *Cyclospermum leptophyllum* and the two *Paspalum* species become well represented. The invasive alien tree species, *Acacia dealbata* and *Eucalyptus grandis* are also well represented.

**Vegetation Unit 3:** This highly transformed and degraded habitat on the site is dominated by grasses and low-growing herbs, of which a number of species are weeds and alien invasives. Disturbances include past agricultural practices (old cultivated lands) and current agricultural practices (overgrazing by livestock from

bordering Clever settlement). Other disturbances include a number of twin tracks, gravel roads etc., traversing this vegetation unit. The absence of palatable climax grass species such as *Themeda triandra*, *Digitaria* species etc. and the abundance of unpalatable, sub-climax and climax grass species such as *Hyparrhenia hirta, H. tamba, Heteropogon contortus, Eragrostis chloromelas, E. curvula, E. plana* and *Pogonarthria squarrosa* are evidence that these areas have been subjected to degradation for a very long period of time and has reached a mature state of retrogression. The dominance of *Eragrostis chloromelas* and *E. curvula* is closely associated with long term overgrazing. The old cultivated lands, such as found over the majority of the project site, are dominated by a number of pioneer grasses and low growing/spreading herbaceous weeds. These species indicate a high level of disturbance in recent times and the relative early stage of succession.

Vegetation Unit 3 comprises of 54 plant species of the total 118 species recorded during the survey, of which 25 are herbaceous species and 18 are grass species. Although the species diversity of herbs is higher than that of the grasses, cover abundance is dominated by the grasses. 15 species of weeds and invasive aliens were noted during the survey and included 5 Category 1 invasive alien species and 1 Category 2 invasive alien species.

Due to the transformed state and the absence of sensitive features within this unit it is the preferred Vegetation unit for the proposed project.

**Vegetation Unit 4:** This vegetation unit covers only a small area of the study area and is associated with rock outcroppings and shallow soils. These outcroppings are sparsely vegetated. Where plant growth is possible, vegetation is usually characterized by the mat forming ferns; *Selaginella dregei* and *Selaginella caffrorum*. Vegetation Unit 4 is not a very species rich unit, containing only 24 species of which 11 grass and 7 herb species occur. 5 alien invasive plant species were found within this unit.

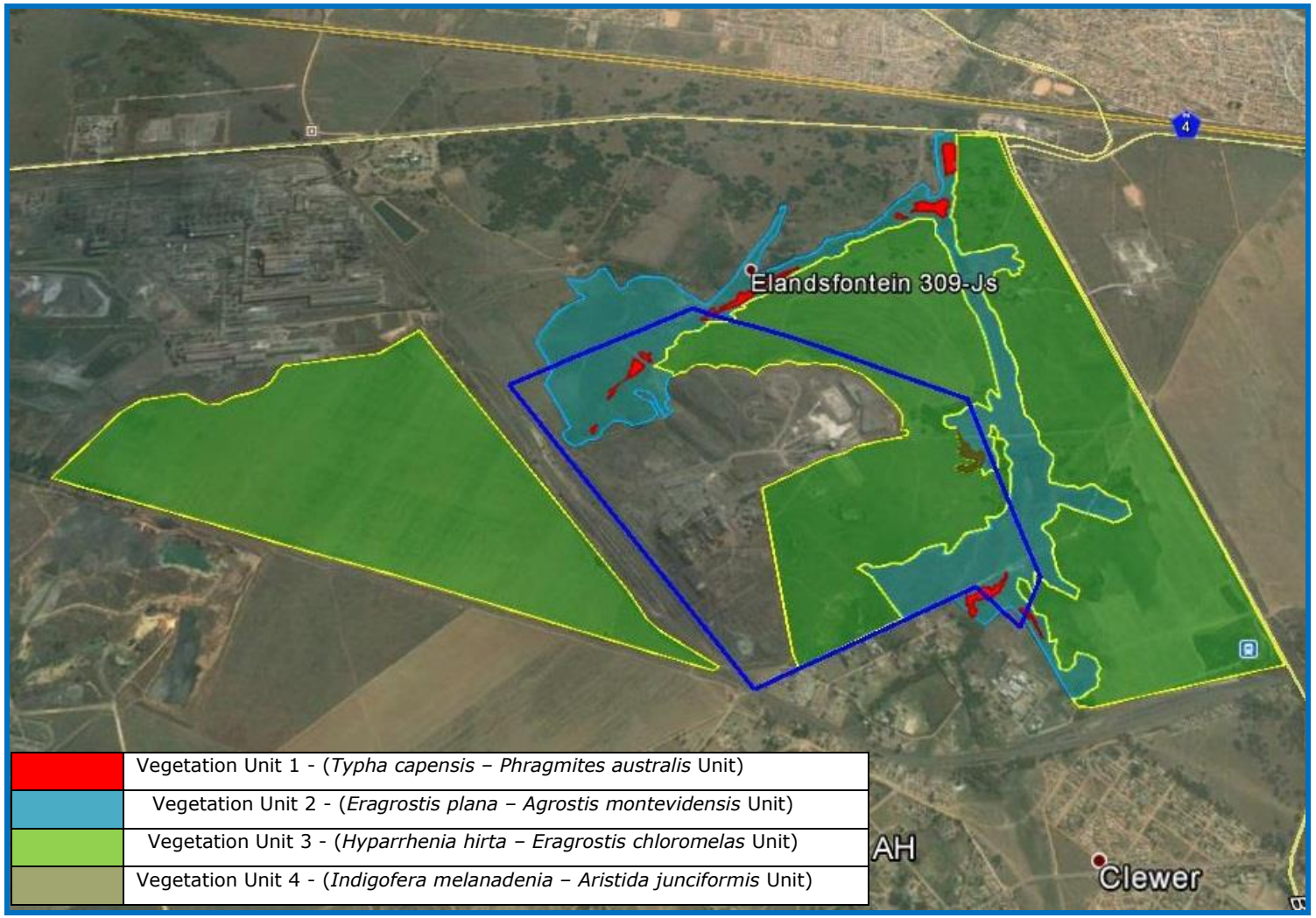



**Figure 6.10:** Vegetation Units occurring in the study area

**Protected species:** During the ecological field survey a total of 118 different species were recorded. No rare, endangered or endemic species were found. Only one Orchid species, *Satyrium longicauda* was recorded within a wetland outside of the project impact area. The species is provincially protected according to Schedule 11 of the Mpumalanga Nature Conservation Act (Act 10 of 1998).

**Alien invasive species**: A total of 26 different species of weeds and invasive aliens were recorded within the study area, comprising 22% of the total species diversity. Of the 26 species, 7 species are categorized as Category 1 invasive aliens (*Solanum sisymbriifolium, Acacia dealbata, Solanum mauritianum, Nicotiana glauca, Cirsium vulgare, Phytolacca octandra* and *Campuloclinium macrocephalum*), and 3 species as Category 2 invasive aliens (*Ricinus communis* var*. communis, Euclayptus grandis* and *Nasturtium officinale*).

## 6.10. Fauna

A list of protected vertebrate species (reptiles, birds, and mammals) that could occur in the study area according to the ADU and SANBI databases, as well as Apps (2000) is presented in Table 6.1. Several amphibians have been recorded for the area, but these are not listed here as none of the species recorded are of any conservation concern. Whilst fauna species are mobile and the impact of new structures does not destroy animals as it does plants, they do depend on specific habitats which could be impacted by the project. For all species that are protected as indicated in the list, the presence and suitable habitat of such species must be verified by a suitably qualified specialist to ensure that the habitat of such species will not be impacted on by the proposed development.

**Table 6.1:** Protected vertebrates that could occur in the study area (MNCA = Mpumalanga Nature Conservation Act)

| Common Name | Species Name | Threat Status |
|---|---|---|
| **Reptiles - Chameleons** | | |
| Common Flap-neck Chameleon | *Chamaeleo dilepis* subsp *dilepis* | MNCA |
| **Reptiles - Geckos** | | |
| Cape Gecko | *Pachydactylus capensis* | MNCA |
| **Reptiles – Lizards and skinks** | | |
| Coppery Grass Lizard | *Chamaesaura aenea* | MNCA, end |
| Large-scaled Grass Lizard | *Chamaesaura macrolepis* | MNCA |

| Common Name | Species Name | Threat Status |
|---|---|---|
| Common Girdled Lizard | *Cordylus vittifer* | MNCA |
| Yellow-throated Plated Lizard | *Gerrhosaurus flavigularis* | MNCA |
| Wahlberg's Snake-eyed Skink | *Afroablepharus wahlbergii* | MNCA |
| Sundevall's Writhing Skink | *Mochlus sundevallii* subsp *sundevallii* | MNCA |
| Cape Skink | *Trachylepis capensis* | MNCA |
| Speckled Rock Skink | *Trachylepis punctatissima* | MNCA |
| Variable Skink | *Trachylepis varia* | MNCA |

The following observations were made during the ecological survey:

» No amphibians, reptiles or mammals were observed during the survey. The reason for this absence or scarcity of faunal species is due to the high disturbance levels of the study area and surroundings (regular ploughing, on-going mining with high noise pollution, and human as well as livestock movement).
» Small rodent holes were noted within Site 1 although these holes seemed abandoned as there were no signs of recent activities around these holes. The most likely rodent species to have inhabited these holes either the Four-striped grass mouse (*Rhabdomys pumilio*) or the pouched mouse (*Saccostomus campestris*).
» Tracks of the Marsh mongoose (*Atilax paludinosus*) were found within one of the valley bottom wetlands. These tracks however were found outside the proposed development sites although it is likely that these animals move between wetlands.
» An extremely low diversity of bird species were recorded during the survey, this could be attributed to the number of disturbances present on site.
» The highest number of bird species noted (although still relatively low) was associated with dense stands of *Typha capensis* and *Phragmites australis* (Vegetation Unit 1). These areas are however located outside the sites selected for the proposed development and will not be impacted by the development.

## 6.12 Land Types (Soils) and Agricultural Potential

### *6.12.1. Soils*

The land type classification is a nation-wide survey that groups areas of similar soil, terrain and climate conditions into different land types. There is a single land type across the proposed project site and surrounding area, namely Bb13. This land type is dominated by deep to moderately deep, yellow, well drained sandy loam soils of the Clovelly, Avalon and Glencoe soil forms. The field investigation

showed that the soils of the two sites are sandy, shallow soils predominantly of the Clovelly soil form and limited in depth by underlying weathered bedrock.

### *6.12.2. Agricultural status*

The proposed power station site is located within a grain farming agricultural region and has been cultivated in the past. The southern section has not been cultivated for at least the last 5 years; however the northern section has been cultivated within that time. There is a reasonable cover of grasses that has established since cultivation ceased. There is no evidence of significant erosion or other land degradation on the site. No agricultural activity currently occurs on the site and there is no agricultural infrastructure situated on the site.

### *6.12.3. Agricultural capability*

Land capability is the combination of soil suitability and climate factors. The land type on which the site is located has a land capability classification, on the 8 category scale, of class 3 – moderate potential arable land. However due to the soil depth constraints on the particular site, it has limitations for cultivation. The combination of depth and sandy texture limit the soil moisture availability for crop production. There are soils in close proximity to Transalloys (Site Alternative 5) that were investigated and that do not have the same depth limitations, making them much more suitable for cultivation.

The potential maize yield for the area is given on AGIS as between 2.5 and 3.4 tons per hectare, and the grazing capacity is given as 8 – 10 hectares per animal unit. Due to the soil depth and moisture holding constraints, the site is marginal for cultivated crops. The most viable agricultural land use for the site is limited to grazing.

## 6.13 Social Characteristics of the Study Area and Surrounds

### *6.13.1. Demographic profile*

The population of the NDM increased from 1 018 422 in 2001 to 1 308 129 in 2011, which represents an increase of ~ 28%. The population of the ELM increased from 276 413 in 2001 to 395 466 in 2011, which represents a significant increase of 43% over the same period. This represents an average annual increase of ~ 2.5% and 3.58% for the NDM and ELM respectively. The majority of the population in the ELM are Africans (81.3%), followed by Whites (15.7%) and Coloureds (0.9%). In terms of gender, 52.8% of the ELM population were males and 47.2% females. This is largely due to the nature of industries around the municipality area which tend to be more male oriented.

The increase in the population in both the NDM and ELM was linked to an increase in the 15-65 and older age groups. The increase in the economically active age group of 15-65 years in the ELM is likely linked to the influx of job seekers to the area from the surrounding rural areas in the province. This is also reflected in the decrease in the dependency ratios in both the NDM and ELM (see below). This highlights the economic importance of the area and towns such as Witbank and Middleburg. As expected, the number of households in both the NDM and ELM increased between 2001 and 2011. The size of the household sizes in both areas essentially remained the same, namely in the region of 3.9-3.2.

The dependency ratio in both the NDM and ELM decreased from 60.7 to 50.4 and 45.4 to 40.4 respectively. The decrease in the NDM as indicated was significant. The age dependency ratio is the ratio of dependents, people younger than 15 or older than 64, to the working, age population, those ages 15-64. The decrease represents a positive socio-economic improvement, and reflects a decreasing number of people dependent the economically active 15-64 age group. As indicated above, there has been an increase in the percentage of economically active people in both the NDM and ELM. The dependency ratios for both the NDM and ELM are lower than the provincial and national ratios, which were 56.0 and 52.7 in 2011 respectively. Over the past 50 years, the value for this indicator has fluctuated between 84.43 in 1966 and 53.29 in 2010.

In terms of percentage of formal dwellings, the number of formal dwellings in the NDM increased from 74.8% in 2001 to 82.8% in 2011. In the ELM the number of formal dwellings also increased from 67.1% to 77.2% for the same period. This represents a positive socio-economic improvement for the area.

The official unemployment rate in both the NDM and ELM also decreased for the ten year period between 2001 and 2011. In the NDM the rate fell significantly from 43.8 to 30.0 %, a decrease of 13.8 %. In the ELM the unemployment rate decreased from 38.4 % to 27.3 %, a decrease of 11.1 %. Youth unemployment in both the NDM and ELM also dropped over the same period. However, the youth unemployment rate in both the NDM and ELM remains high at 39.6 % and 36.0% respectively. The unemployment rate for females in the ELM was 37.1% compared to 20.8% for males. This reflects the dominant role played by the mining sector in the ELM economy.

The education levels in both the NDM and ELM also improved, with the percentage of the population over 20 years of age with no schooling dropping in the NDM decreasing from 24.9 1% to 11.5%. For the ELM the decrease was from 15.7% to 5.8%. The percentage of the population over the age of 20 with matric

also increased in both the NDM and ELM, from 20.1% to 29.4% in the NDM and 24.4% to 31.4% in the ELM.

### *6.13.2. Economic profile*

**Mining sector:** The economy of the ELM is driven by the Mining sector which contributed more than 50% to the economic activity of the LM in 2009, followed by Electricity at 12.1% and Finance at 10.8%. The mining sector is also the most important sector in terms of job creation. The importance of the Mining sector has also increased, increasing from 41% in 2007, to 50.8% in 2008, with a slight decline to 49.8% in 2009. The majority of the mining in the ELM is linked to coal. Coal produced within eMalahleni is for both the local and export markets. For the local market, Eskom is the major buyer while China is the major export buyer. However, the current condition of the rail freight transportation system for transporting coal to power stations within Mpumalanga and Richards Bay is one of the biggest challenges faced by mining houses within the ELM and this has put a strain on the road infrastructure which requires regular repairs. The large scale mining has also been at the expense of the agricultural sector. The IDP does, however, note that coal mining and electricity generation within the ELM do pose serious challenges around environmental degradation and pollution from greenhouse gas emissions which calls for special focus being given on the green economy and related projects.

The IDP identifies a number of factors limiting or capable of limiting the ability of the mining sector to increase production and improving their operational efficiency. Two of the factors identified are also relevant to the proposed project, namely:

- Shortage of energy due to Eskom electricity outages that tend to cause machine breakdowns and work stoppages;
- Shortage of skilled labour, particularly skilled artisans and technicians among the previously disadvantaged population groupings;

In terms of potential growth the key sectors identified in the IDP include Finance, Trade and the green economy. Of concern is the contribution of the Agricultural sector which is relatively low compared to the other sectors of the economy.

**Manufacturing sector**: The IDP notes that the performance of the ELMs Manufacturing sector over the past few years is of concern. Given the location of some of the major steel manufacturing companies such as Highveld Steel within the locality, the sector contribution to GVA-R and growth rates are expected to out-perform sectors such as finance and trade. However, the lack of diversification of the sector and its concentration on metal products is identified as a key factor contributing to the present performance state of the sector.

In terms of job creation the manufacturing sector is a key sector, specifically given the potential for beneficiation and longer value chains, economic growth and SMME development. The IDP notes that given the proxy relationship between manufacturing and other sectors such as mining, agriculture and construction the manufacturing sector potential within ELM requires attention. In this regard the IDP recommended that the ELM should develop an Industrial Development Plan in which extensive and intensive research is undertaken to unlock the manufacturing potential that is linked to mining and agriculture as well as other support services sectors.

**Tourism sector:** Business tourism is identified as the key contributor to the performance of the hospitality services sector within the ELM. Key clients were identified and categorised as government employees from both national and provincial, mine employees and executives visiting the various mining houses and other businesses across the municipal area, friends and relatives visiting and tourists and travellers in transit either to the Lowveld or Maputo as well as those to Gauteng.

The IDP identifies a number of potential constraints facing the tourism sector. Of relevance to the proposed project are power failures and the impact on business reputation and loss of confidence by clients.

### *6.13.3. Labour force and Employment Structure*

Mpumalanga's labour market is characterised by a low participation rate and a high unemployment rate. In 2007, the unemployment rate in the province was estimated at 22.9%. The figure for 2011 was 31.6% (Census 2011). Unemployment rates in Mpumalanga are high even for individuals who have completed their secondary education. The share of the unemployed with higher levels of education has increased from 20.7% 1995 to 32% in 2006, an increase of more than 10%. This appears to point towards the lack of returns to education in the Mpumalanga labour market, unless an individual has a tertiary education, in which case there are larger returns in Mpumalanga than in the rest of the country.

In terms of population groups and gender, unemployment among Africans (38.7%) was more than four times that of Whites in 1995, while in 2006 this ratio had increased almost 10-fold. Females in Mpumalanga have an unemployment rate roughly twice that of males with the total female unemployment rate at approximately 50%.

On the positive side, the MPGDS states that total employment in Mpumalanga has increased by an average of 2.9% per year, which is close to the rate of economic expansion in the province (3.1%). Overall, output expansion in the province was accompanied by employment growth, with every 1% of GGP growth in the province translating into a 0.92% increase in employment. Therefore, no jobless growth is evident for the province as a whole despite the considerable jobless growth in the period 1995 to 2005, in the agriculture, mining and utilities sectors.

### *6.13.4. Status of infrastructure and basic service delivery*

With the exception in of the percentage of households with weekly refuse removal in the Nkangala District Municipality, the provision of access to municipal services as measured in terms of flush toilets, refuse removal, piped water and electricity, increased in both the district and local municipality for the period 2001 to 2011 which are also higher than the provincial average. These improvements will have contributed to the overall improvement in the quality of life of the residents in the district and local municipalities, albeit lower than the national levels. The services levels in the eMalahleni Local Municipality are also lower than the national levels for households that use electricity. This is ironic given that the ELM is a key producer of electricity in South Africa.

## 6.14. Heritage and Paleontological Profile

The **Stone Age** is divided into Early Stone Age (ESA); Middle Stone Age (MSA) and Late Stone Age (LSA) and refers to the earliest people of South Africa who mainly relied on stone for their tools. Very few ESA sites are on record for Mpumalanga and no *in situ* sites dating to this period are expected to occur in the study area. An example in Mpumalanga is Maleoskop on the farm Rietkloof where ESA tools have been found. This is one of only a handful of such sites in Mpumalanga. The MSA has not been extensively studied in Mpumalanga but evidence of this period has been excavated at Bushman Rock Shelter, a well-known site on the farm Klipfonteinhoek in the Ohrigstad district.

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD
- The Late Iron Age: 14th century to colonial period.

The **Iron Age** is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable

environment to make a better living. No Sites dating to the Early or Middle Iron Age have been recorded or are expected to occur within the study area.

### *6.14.1. Palaeontology*

The Vryheid Formation in which the study area occurs is fossiliferous (occasionally richly) elsewhere in the Main Karoo Basin. The Vryheid Formation contains both plant macrofossils of the Glossopteris Flora and trace fossil assemblages that are potentially highly significant to the cultural and scientific heritage of South Africa. As such, fossils are potentially present. A regolith cover is inferred to be present over much of the project area. The fossiliferous potential of this unit is assumed to be low due to the generally sporadic and scarce nature of fossils in the geological record.

### *6.14.2. Heritage Sites identified within the Study Area*

The demolished remains of structures are found scattered over the area, but nothing is left of these structures apart from concrete slabs. These sites are of no significance as nothing is left of the structures to mitigate or interpret and no further action is necessary for these sites. A single standing modern face brick, utility building is located on site alternative 4. Two initiation sites occur in the study area near to the Brugspruit, however they are located outside of the proposed project footprint. Lastly a cemetery (Figure 6.11) was recorded but is also located outside of the project footprint. The locality of these sites is indicated in Figure 6.12.

**Figure 6.11:** Cemetery site occurring on Transalloys property near to main access road

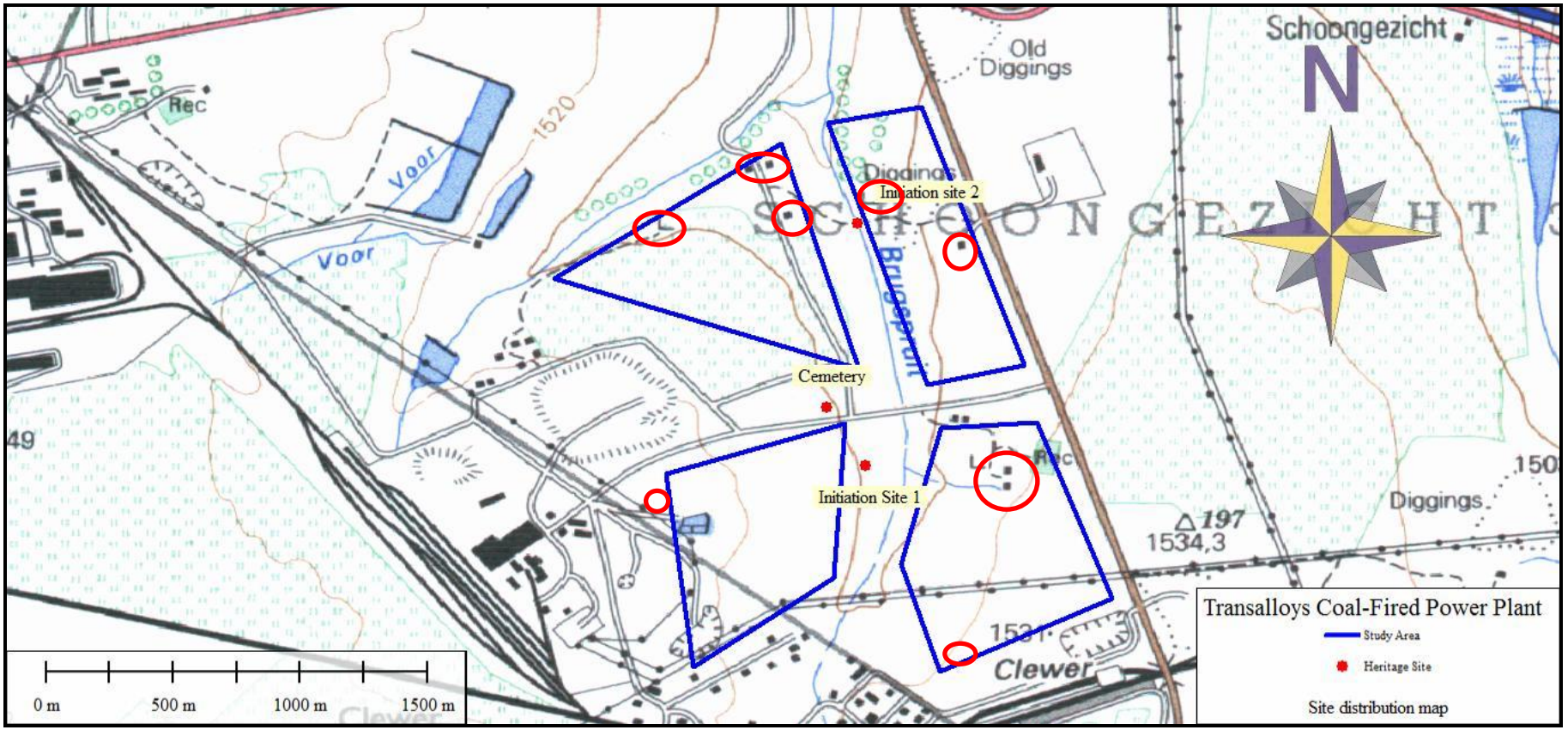



**Figure 6.12:** Location of the recorded heritage sites (red dots) as well as demolished buildings (red circles) in relation to the proposed power station site alternatives (blue polygons)

# ASSESSMENT OF IMPACTS CHAPTER 7

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the proposed Transalloys Power Station. Importantly, the assessment was based on a 150 MW power station which represents a worst-case scenario in terms of the anticipated environmental impacts. The development of a 55MW power station would serve as mitigation of the anticipated construction and operational impacts of the 150 MW plant due to the lower impact probability.

This assessment is undertaken for all the phases of the project's development and for all the facility's components which will comprise of the following:

» Power plant
» Access roads within the project locality boundaries, and upgrading and tarring of the existing provincial road
» Turbine and steam generator building
» Coal storage pile area
» Boiler sorbent storage pile area
» Coal and sorbent offloading facilities and conveyors
» Power plant production areas (including Power Island Units/s and Balance-of-Plant, offices, operations, logistics and maintenance area/s).
» Smoke stack of between 60m and 250m in height.
» Raw-Water Storage reservoir and Pump-station.
» Water and Sewage Treatment plant.
» Engineered and lined ash disposal facility.
» Pollution and Storm-water Control Facilities and Dams.
» An HV-Yard and Substation, adjacent to the Power Plant.
» An overhead power line of between 33kV and 132kV to connect the power station to the existing Transalloys Substation.
» A raw water supply pipeline from the EVRAZ Highveld Steel plant to the project water treatment plant.
» Administration building, guardhouse, maintenance building and warehouse.

The development of the project will comprise the following phases:

» *Pre-Construction and Construction* – will include preconstruction surveys; site preparation; establishment of the access road, electricity generation infrastructure, water supply infrastructure, power line servitudes, conveyor servitudes, construction camps, storage facilities, laydown areas, transportation of components/construction equipment to site; and undertaking

site rehabilitation and establishment and implementation of a waste and stormwater management plan.

» *Operation* – will include sourcing of water and water treatment; operation of the facility and the generation of electricity; deposition of ash on ash disposal facility; and site operation.
» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately within this chapter.

## 7.1. Potential impacts identified during the Scoping Study required to be assessed

Areas or issues identified through the Scoping process as requiring assessment in the EIA Phase include the following:

» Ecological impacts;
» Agricultural and land-use impacts;
» Impacts on surface water resources including watercourses and wetlands;
» Impacts on groundwater resources;
» Air quality impacts from the proposed power station and ash disposal facility;
» Noise impacts;
» Visual impacts;
» Traffic impacts;
» Social impacts;
» Cumulative impacts for all of the above.

Sensitive environmental receptors identified during the Scoping phase, in terms of which the significance of the impacts has been assessed, included the following:

» Social-receptors (formal residential areas) in close proximity the project site;
» Noise sensitive receptors;
» Air Quality sensitive receptors;
» Visually sensitive receptors;
» Rivers / tributaries of rivers and wetlands;
» Areas of flora and faunal sensitivity;
» Heritage sites.

These aspects of environmental concern and sensitive environmental receptors have been assessed during the EIA Phase. These sensitivities have accordingly been mapped based on the detailed field studies (refer to Figure 9.1).

## 7.2. Methodology for the assessment of potentially significant impacts

### *7.2.1 Rationale for the assessment of the preferred site*

Five site alternatives all within near proximity to the existing Transalloys smelter complex were evaluated within the scoping phase study for the purposes of considering which of the sites are preferred for the siting of the proposed project. During the scoping phase it was concluded that all five site alternatives could be considered for the project and that none of the sites were fatally flawed as a result of environmental sensitivity or technical constraints.

However, following the completion of the Scoping phase and as described in Chapter 4 and Chapter 6, site alternatives 1 and 2 emerged as the most technically feasible sites based on selected technical and economic criteria. Importantly sites 1 and 2 are unimpeded by competing future mining land uses which include the proposed Landau Colliery Expansion Project (conflicting with site alternatives 3 and 4) and mine prospecting applications to the west (conflicting with site alternative 5), and are considered to be the most suitable candidate sites for the proposed project. Site alternatives 3, 4 and 5 are no longer considered to be preferred sites on the basis of technical and land use issues. As the land area of both sites 1 and 2 is required within which to develop the project, site alternatives 1 and 2 will henceforth be considered as a single project site for the purposes of the assessment.

This assessment therefore considers potential environmental impacts associated with the development of the proposed power station (as well as associated infrastructure) and the ash disposal facility over alternative sites 1 and 2.

### *7.2.2 Rationale for the assessment of the water pipeline*

Other infrastructure which is required to be evaluated separately to the proposed power station and ash disposal footprint in this EIA Report is the proposed water supply pipeline for Transalloys power station, due to the fact that the impacts of the proposed water pipeline extend outside of the power station project footprint.

Two raw water supply sources were considered including supply from Highveld Steel and EWRP. The alternative to source raw water from Highveld Steel was not presented during the Scoping Phase, but was introduced at the EIA phase due to the proposed expansion of the Landau Colliery, which rendered it difficult for

Anglo Coal, as surface rights holder, to approve a pipeline route to the EWRP adjacent to existing roads within the surface rights area of the Landau Colliery.

The pipeline route to EVRAZ Highveld Steel is considered the preferred route as it is significantly shorter (2km), resulting in reduced environmental and capital cost, than the pipeline to the EWRP (9km), or a further alignment bypassing the entire surface right area (in excess of 15km).

The proposed water pipeline route as described at the scoping phase largely conformed to existing road servitudes. However due to anticipated changes within the landscape resulting from the execution of the proposed Landau Colliery Expansion Project, other alternatives were considered during the EIA phase and include:

- After exiting the proposed project site at the south eastern boundary, complete alignment of the proposed pipeline with road infrastructure through Clewer and within the Landau Colliery Surface Rights Area (10.5km in length).
- After exiting the proposed project site at the north western boundary, complete alignment of the proposed pipeline along existing service roads (2km in length) on land owned by EVRAZ Highveld Steel. This is the preferred alternative.

Both routes have been considered within this impact assessment (refer to Figure 4.3).

### *7.2.3 Assessment of issues and impacts*

The assessment of potential issues has involved key input from specialist consultants, the project developer and his engineer, key stakeholders, and interested and affected parties (I&APs).

In order to assess the potential impacts, a preliminary layout of the facility was provided by the developer and his engineer for consideration by the specialist consultants (refer to Chapter 3 and Appendix A). The footprint/ dimensions of the project and its associated infrastructure in terms of which the impacts were assessed are tabled in Section 3 of this report. Key infrastructure and the respective footprints/dimensions included within the assessment of impacts includes the following[19]:

[19] Note that the assessment is based on the 150 MW power plant alternative representing a worst case scenario. Accordingly all mapping and the assessment of impacts has been undertaken for the 150 MW power station scenario.

» Power plant and associated infrastructure including evaporation pond – up to 46 ha in extent.
» Ash disposal facility area – Up 38 ha in extent and 50m in height with a life of approximately 30 years; and
» Water supply pipeline – 2 km in length.

In addition, waste treatment and management activities have been considered in the assessment of impacts. These activities relate specifically to:

» Liquid waste disposal;
» Solid waste disposal;
» Waste storage and separation;
» Waste transport; and
» Solid waste disposal.

Direct, indirect and cumulative impacts were assessed in terms of the requirements of the EIA Regulations and the methodology presented in Section 5.3.4 of this report.

## 7.3. Assessment of the Potential Impacts associated with the proposed Power Station and Associated Infrastructure

This section of the report presents a summary of the impacts identified and assessed for the proposed project. Details of the methodology of assessment and impact assessment determination by each specialist are included within the specialist reports contained within Appendices E – O.

## 7.4 Potential Impacts on Ecology

### *7.4.1 Results of Impact Assessment*

**Flora:** As indicated in Section 6.9.2, four main vegetation units were identified over the five site alternatives, with the following units present over the identified project site:

» Vegetation Unit 2: *Eragrostis plana – Agrostis montevidensis* unit.
» Vegetation Unit 3: *Hyparrhenia hirta – Eragrostis chloromelas* unit.
» Vegetation Unit 4: *Indigofera melanandenia – Aristida junciformis* unit.

Vegetation Unit 3 occurs most widely across the study area and is of low ecological sensitivity (refer to Figure 7.2). Development of the power plant footprint will be confined to this vegetation unit while the majority of the ash disposal facility footprint will be located within this unit.

Vegetation Unit 2 is associated with wetland areas delineated in the study area and is considered to be of high ecological sensitivity. Approximately 8ha of this vegetation unit will be lost for the development of the ash disposal facility.

Only one protected plant species *Satyrium longicauda* was recorded within a wetland outside of the project impact area. This species could potentially be affected by the proposed water pipeline alignment.

**Fauna:** The study area was investigated during the vegetation survey for signs or the presence (observations) of amphibians, reptiles, and mammals. No protected or endangered faunal species were noted within the study area.


**Figure 7.2:** Ecological sensitivity map indicating overlay of 150MW power plant. 55MW plant would be restricted to northern site (triangle)

***Power Line:***

The floristic sensitivity of the vegetation types within the power line corridor is considered to be low for the entire length of the power line as it is restricted to vegetation unit 3 (low ecological sensitivity) mapped on the project site and is aligned largely to existing service roads adjacent to the existing smelter complex.

***Water pipeline:***

The proposed water pipeline alignment conforms largely to existing service roads from the supply point (Highveld Steel) to the point of demand (power station). The floristic sensitivity of the vegetation types along the water pipeline route are considered to be low for the entire length of the pipeline, up until the point where it traverses the western tributary of the Brugspruit approaching the proposed power station site (which has been mapped as high sensitivity due to wetland and riparian habitats present in this area). Only one protected plant species *Satyrium longicauda* was recorded within a wetland which could potentially be affected by the proposed water pipeline alignment.

### *7.4.2 Summary of Impact Assessment*

No impacts were identified that could lead to a beneficial impact on the ecological environment of the study area since the proposed development is largely destructive, involving the alteration or degradation of habitat that is described as transformed and of low ecological function for the most part.

Impacts resulting from the proposed development on floristic and faunal attributes of the study area are largely restricted to the physical effects of habitat clearance and the establishment of artificial habitat. Direct impacts include any effect on the natural environment where species (populations, individuals or overall species richness) are affected; recovery is usually not possible. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of special concern. Impacts on sensitive or protected habitat are also included in this category, but only on a local scale. These impacts are mostly measurable and easy to assess, as the effects thereof are immediately visible and can be determined to an acceptable level of certainty.

Other direct impacts include the compaction and disturbance of soils and alteration of soil surface properties, reduced buffering capacities of the landscapes during extreme weather events and possible contamination of topsoil and surface water by chemicals or oils.

Impacts of a cumulative nature place direct and indirect impacts of this project into a regional and national context, particularly in view of similar or resultant developments and activities in the region.

Table 7.1 provides a summary of the assessment of potential impacts on flora, fauna and ecology. More detail regarding the impacts and determination of significance is provided within the specialist ecological report contained in **Appendix E**.

**Table 7.1:** Summary of impacts on Ecology

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Construction and operation of the power plant, ash disposal facility, power line and water pipeline within Vegetation Unit 3 | High (negative) | Low (negative) | » Altered vegetation composition and structure.<br>» Contamination of topsoil.<br>» Potential for invasion by weed or alien species. |
| Construction and operation of the ash disposal facility and water pipeline within Vegetation Unit 2 | High (negative) | High (negative) | » Altered vegetation composition and structure.<br>» Contamination of topsoil.<br>» Potential for invasion by weed or alien species.<br>» Alteration and disturbance of wetlands |

**Mitigation:**

» Limit construction activities to the development footprint as far as possible.
» All ponds and dams should be appropriately designed and lined to ensure no overflowing or leaking of pollutants into the wetland systems in case of abnormal and unforeseen events.
» All storm water drainage pipes and other piping or channel systems releasing surface and storm water runoff should contain bio filters.
» Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from occurring in accordance with a stormwater management plan.
» Regular monitoring of erosion should be done and if detected should be rehabilitated and additional structures should be installed (e.g. gabions) to slow down surface runoff and prevent further erosion from occurring.
» During construction create designated turning areas and strictly prohibit any driving and parking outside of designated areas.
» Avoid disturbance of semi-natural grasslands outside of the immediate footprint as far as possible.
» Infill material must be sourced from approved sources, free of invasive species.

» Prevent any spillage of pollutants and contaminated water during the construction phase into the wetlands.
» Monitor the establishment of invasive species and remove as soon as detected using approved methods.
» Existing roads should be used as far as possible.

### *7.4.3 Comparison of Alternatives*

**Site alternatives:** The relationship of the delineated vegetation units in the context of the sites considered for the siting of the power station and associated infrastructure is as follows:

Preferred sites
» Site 1: Site 1 is located exclusively on a highly transformed and degraded Vegetation Unit 3 (old cultivated land).
» Site 2 - Of the approximately 68 ha more than 94% of Site 3 is located on highly transformed and degraded Vegetation Unit 3. Only a small portion (6%) of the High Sensitive Vegetation Unit 2 (small hillslope seepage) is located within this site.

Not-preferred sites
» Site 3: The largest portion of Site 2 is located on the Low Sensitive, Vegetation Unit 3 however Highly Sensitive Vegetation units 1 and 2 occur in the south and south eastern of the site. Also present near to Site 2 is a small isolated rock outcrop.
» Site 4: The largest portion of Site 4 (± 80%) is located on Vegetation Unit 3. To the west and south, Site 3 is situated on the Highly Sensitive, Vegetation Unit 2.
» Site 5: Site 5 is located exclusively on a highly transformed and degraded Vegetation Unit 3.

All five of the site alternatives considered for the siting of the proposed power station during the EIA process and associated infrastructure are ascribed to be primarily of low ecological sensitivity due to the nature of transformation on the sites from past land use activities. The sensitivity of sites 1 to 4 however is influenced by the proximity or relationship of each site to the Brugspruit and its associated habitat units of high sensitivity (wetlands), with site 2 being the most affected due to wetland vegetation associations present there. Development of Site 5 will have the lowest ecological impact but the highest agricultural impact.

Effects from the construction and development of the proposed power station on fauna and faunal habitats will not vary significantly between the alternative sites due to the low faunal abundance on the sites.

**Water Pipeline:** Both the EWRP and Highveld Steel water supply pipeline route options considered (as mapped in Figure 4.3) are situated parallel to existing roads for almost their entire length (and therefore impacts can be limited to the road servitude), and traverse the Brugspruit or its tributary in the near vicinity of the proposed power plant. By virtue of the Highveld Steel water pipeline option being the shortest route, this alternative will result in less surface disruption and have a lower environmental impact. The Highveld Steel water connection option is therefore preferred.

**Technology / layout alternative:** The 55MW power plant is preferred over the 150 MW alternative from an ecological perspective as the associated infrastructure (namely the ash disposal facility) can be located outside of the areas of high ecological sensitivity.

### *7.4.4 Implications for project implementation*

» The proposed power station and associated infrastructure will be situated exclusively on Site 1 which occurs within a vegetation unit of low ecological sensitivity but in close proximity to vegetation unit (wetland) of high sensitivity. Adequate mitigation measures must be taken to ensure that impacts on high sensitive environments near the proposed plant are avoided.
» The majority of the planned ash disposal facility is situated on a vegetation unit of low ecological sensitivity within Site 2. However the southern section has a high sensitivity despite its transformed and degraded state (low Present Ecological Status). The loss of areas of high ecologically sensitive areas amounts to approximately 10ha. This is only applicable for the 150 MW power plant option.
» Prior to commencement with construction of the water pipeline, a survey for the detection of protected plant species must be undertaken.
» The Water Use License application should include application for the destruction of the affected section of wetland (for the 150 MW option only). Suitable offsets or rehabilitation measures will be required to be included in a rehabilitation plan for the affected wetland and other wetlands surrounding the project site.

### *7.4.5 Conclusions and Recommendations*

While most of the expected impacts on ecological resources associated with this development of the actual footprint will be unavoidable, the success of mitigation will be determined by the success of preventing impacts from spreading outside the footprints of the development. Aspects such as infestation of surrounding habitat by alien and invasive species, the introduction of non-endemic and

invasive animals, dust, effluents, contamination, hydro-carbons spillages, human-animal conflict situations, etc. will represent the ultimate challenge of the environmental management plan as these aspects will cause the spread and exacerbation of impacts into the natural environment caused by the development.

Ultimately, the expected loss of natural resources from the site and immediate surrounds because of the development will result in significant, but localised, impacts on the natural environment. Animals could potentially be affected, but the mobility of most species renders the probability of this impact unlikely.

These aspects are likely to be more significant with the future extension of the Landau Colliery set to occur within the immediate area. Impacts of a cumulative nature, although estimated to result in moderate significance, represent a continuous, low level threat to biodiversity on a local and regional scale. The increase in industrial and mining activity in the region implies constant losses of natural habitat and species. This is exacerbated by the decline in environmental quality caused by peripheral and indirect impacts such as species invasion, degradation, contamination, disruption of ecological processes, habitat fragmentation and isolation, etc.

In conclusion, no specific impact was identified that would render the proposed development as an unacceptable threat to the biological environment or any specific aspect or species that are known to occur, or could potentially occur within the study area or required servitudes, provided that detailed, comprehensive and sensible environmental management principles are applied throughout the lifetime of the operation.

## 7.5 Potential Impacts on Soils

### *7.5.1 Results of Impact Assessment*

The establishment of a power station at the existing Transalloys smelter complex will result in the permanent loss of land to agriculture. The area will be re-zoned and rehabilitation of the site back to agricultural production will not be feasible. However, because of soil depth and moisture holding constraints, surrounding industrial context and extension of the Landau colliery, the site is considered marginal for cultivation or future agricultural use.

### *7.5.2 Summary of Impact Assessment*

Table 7.2 provides a summary of the assessment of potential impacts on soils and agricultural potential. More detail regarding the impacts and determination of significance is provided within the specialist report contained in **Appendix F**.

**Table 7.2:** Summary of impacts on Soils and Agricultural Potential

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Permanent loss of agricultural land due to direct occupation of land by power station and power line infrastructure | Medium (negative) | Not possible to mitigate | The overall loss of agricultural land in the region due to other mining and infrastructure developments – medium significance. |
| Soil erosion due to alteration of surface characteristics due to vegetation removal and surface disturbance, resulting in loss and deterioration of soil resources. | Low (negative) | Low (negative) | None |
| Loss of topsoil due to poor topsoil management (burial, erosion, etc.) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) resulting in loss of soil fertility on disturbed areas after rehabilitation. | Low (negative) | Low (negative) | None |

**Mitigation:**

» Strip and stockpile topsoil from all areas where soil will be disturbed. If an activity will mechanically disturb below surface in any way, then the upper 40 cm of topsoil should first be stripped from the entire disturbed surface and stockpiled for re-spreading during rehabilitation.
» Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.
» After completion of construction activities, re-spread topsoil over the surface. Ensure effective topsoil covering to conserve soil fertility on all disturbed areas.
» Dispose of any sub-surface spoils from excavations where they will not impact on agricultural land, or where they can be effectively covered with topsoil.

### *7.5.3 Comparison of Alternatives*

**Site and layout alternatives:** Based on the soils and agricultural study undertaken site 5 is the least preferred site for development from an agricultural perspective as the site is much more suitable for commercial cultivation (as is currently practiced) than the other site alternatives. Sites 1-4 are more suitable for the development of the power station due to marginal agricultural potential.

**Water Pipeline:** There is no preferred alternative from an agricultural impact perspective for the alignment of the water supply pipeline for this project.

**Technology / layout alternative:** The 55MW power station is preferred from an agricultural perspective over the 150 MW alternative as the development footprint will be much reduced and consequently less agricultural land will be occupied by the proposed power station.

### *7.5.4 Implications for project implementation*

It is not possible to mitigate the impacts associated with loss of agricultural potential. However, the project site is situated in an area characterised by mining and industrial development and is not considered to be viable agricultural land contributing to food security within the province.

### *7.5.5 Conclusions and Recommendations*

The key findings of this study are:

» The development of the power station will have low to medium negative impact on agricultural resources and productivity.
» The significance of all agricultural impacts is influenced by the fact that the land is suitable for cultivation, although the depth constraints of the particular soils on site make it marginal.
» Soils across the power station site (sites 1 and 2) are dominated by deep to moderately deep, yellow, well drained sandy loam soils of the Clovelly, Avalon and Glencoe soil forms.
» Agricultural limitations are the depth constraints of the particular soils on site as well as competing land uses (industry and mining).

There are no fatal flaws associated with agriculture on the site and the project can therefore be developed, with the use of good soil management measures, during all its phases.

## 7.6 Potential Impacts on Surface Water

### *7.6.1 Results of Impact Assessment*

**Existing permits and surface water studies undertaken:** Transalloys, as a water user is required to undertake surface water quality monitoring in terms of its Water Use License (dated 05/2011). The surface water specialist study conducted for the proposed power station considered the potential impact on surface water resources within the study area, and also took cognisance of

historic surface water studies and information provided by Transalloys through the existing water quality monitoring programme. This information included a floodline delineation, bio-monitoring results and wetland studies which are included in the appendices of the surface water report (Appendix G).

**State of the catchment:** The proposed project is situated within Quaternary Drainage Region B11K, of the Upper Olifants Sub-Water Management Area. According to the approved reserve for the various river ecosystems in the Upper Olifants, Wilge and Olifants-Loskop catchments, the Present Ecological State (PES) of the rivers of the B11 catchment are generally in an E ecological category. This indicates a seriously modified system where a great or extensive loss of natural habitat, biota and basic ecosystem functions has occurred. As a result, there are few fish species present, the riparian vegetation is disrupted, and tolerant and exotic fauna and flora is dominant. The region is classified as a low priority area in terms of the SANBI River Freshwater Ecosystem Protected Areas (FEPAs).

**Regional water supply considerations:** Population growth and economic growth, which also relates to socio-economic standards, are regarded as the primary determinants with respect to future water requirements (DWAF, 2004b). Based on the scenarios for population and economic growth, initial estimates of possible future water requirements within the catchment until 2025 were made. This included provision for known and probable future developments with respect to power generation, irrigation, mining and bulk users. No meaningful change in the rural requirements for water was foreseen.

**Surface water resources and quality:** The identified water resources, within close proximity to the project site include the Brugspruit to the east of the project site and an unnamed western tributary of the Brugspruit found to the north-west of the proposed power plant. Wetlands have been delineated within the study area, the results of which are described and assessed elsewhere in this report. Surface water samples were collected (on 8 September 2014) to determine the quality of water in the immediate vicinity of the proposed project site. The field survey confirmed the state of watercourses in the area to be in a PES of poor to fair, with a marginal/low ecological importance and sensitivity. The results of the water sampling are indicated in Table 7.3 at four survey points upstream, downstream of Transalloys and at the Brugspruit confluence. Most notable are exceedances of domestic quality limits for Faecal Coliform Bacteria, E. Coli, Aluminium, Iron and Manganese.

**Table 7.3:** Surface Water Quality Laboratory Analyses Results (2014)

| Variable | Unit | Sampling Points 2014 | | | | Domestic TWQR |
|---|---|---|---|---|---|---|
| | | TRS/US | TRS/US 2 | TRS/DS | Confluence | |

| Variable | Unit | Sampling Points 2014 | | | | Domestic TWQR |
|---|---|---|---|---|---|---|
| | | TRS/US | TRS/US 2 | TRS/DS | Confluence | |
| pH | | 7.2 | 7.2 | 7.3 | 7.5 | 6.0 – 9.0 |
| EC | mS/m | 69.7 | 53.1 | 51.3 | 62.2 | 0 – 70 |
| TDS | mg/l | 374 | 358 | 396 | 450 | 0 – 450 |
| Suspended Solids | mg/l | 35 | <1.0 | <1.0 | 14.4 | --- |
| Total Alkalinity as CaCO3 | mg/l | 168 | 52 | 60 | 32 | --- |
| Chloride as Cl | mg/l | 36 | 45 | 41 | 30 | 0 – 100 |
| Sulphate as SO4 | mg/l | 99 | 90 | 76 | 207 | 0 – 200 |
| Fluoride as F | mg/l | 0.3 | 0.5 | 0.2 | 0.8 | 0 – 1 |
| Nitrate as N | mg/l | <0.2 | <0.2 | 0.9 | 1.1 | 0 – 6 |
| Nitrite as N | mg/l | <0.1 | 0.1 | <0.1 | <0.1 | 0 – 6 |
| Total Phosphate as P | mg/l | 3.4 | 1.1 | 0.4 | 0.2 | --- |
| Ortho Phosphate as P | mg/l | 2.1 | 0.5 | 0.3 | <0.2 | --- |
| Faecal Coliform Bacteria | /100 ml | >100 000 | 1 500 | 870 | 19 | 0 |
| E. Coli | /100 ml | >100 000 | 1 400 | 820 | 17 | 0 – 1 |
| Sodium as Na | mg/l | 42 | 45 | 46 | 46 | 0 – 100 |
| Calcium as Ca | mg/l | 26 | 19 | 17 | 41 | 0 – 32 |
| Magnesium as Mg | mg/l | 13 | 10 | 9 | 10 | 0 – 30 |
| Aluminium as Al | mg/l | 0.181 | 0.119 | <0.1 | 0.391 | 0 – 0.15 |
| Iron as Fe | mg/l | 0.991 | 1.51 | 0.83 | 0.191 | 0 – 0.1 |
| Lead as Pb | mg/l | <0.02 | <0.02 | <0.02 | <0.02 | 0 – 10 |
| Manganese as Mn | mg/l | 0.691 | 0.806 | 1.54 | 0.239 | 0 – 0.05 |
| Silicon as Si | mg/l | 4.8 | 5.3 | 5.2 | 4.0 | --- |
| Vanadium as V | mg/l | <0.025 | <0.025 | <0.025 | 0.449 | 0 – 0.1 |
| Zinc as Zn | mg/l | 0.026 | <0.025 | <0.025 | <0.025 | 0 – 3 |

**Aquatic biodiversity:** According to the Mpumalanga Biodiversity Conservation Plan (MBCP) the proposed project site is located within a sub-quaternary catchment with an aquatic ecosystem classified as "Ecosystem Maintenance". This implies that any form of land use should aim to at least maintain the basic ecosystem functions of the aquatic environment and resources. The proposed power plant project area is not located within any aquatic biodiversity or ecological corridors.

### *7.6.2 Summary of Impact Assessment*

The following activities / risks could impact detrimentally on the water quality of surface resources during the construction phase:

» Removal of vegetation and topsoil at the proposed power plant area as well as new access road construction.

» Concrete batching activities.
» Spilling and leakages of lubricants, chemicals and fuels used during construction.
» Transportation of material to site and the storage of material on site.
» Dust fallout as a result of construction activities.
» Alteration of the natural characteristics of water resources.

The following activities / risks could impact detrimentally on the water quality of surface water resources during the operational phase:

» Contaminated runoff from the power plant infrastructure areas and ash disposal facility.
» Risk of over-flow from the evaporation pond into the nearby drainage lines.
» Spilling and leakages of lubricants, chemicals and fuels used during operation.
» Transportation of material to site and the storage of material on site.
» Dust fallout (including ash generated by plant) affecting surface water quality.
» Containment of dirty storm water on site.
» Alteration of the natural characteristics of water resources.

Positive impacts are also likely to be experienced, e.g. rehabilitation of catchment area, increase in water table etc. as a result of the implementation of the project.

Table 7.4 provides a summary of the assessment of potential impacts on surface water. More detail regarding the impacts and determination of significance is provided within the specialist report contained in **Appendix G**.

**Table 7.4:** Summary of impacts on Surface Water

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Destruction or degradation of drainage areas and consequent loss of aquatic biodiversity and integrity. | High | Medium | Potential impacts on the regional water balance, water quality degradation due to incidental waste and waste water discharges and storm water management at the proposed power plant area. |
| Erosion of exposed topsoil may increase suspended solids and cause siltation of nearby watercourses. | Medium to High | Low to Medium | |
| Removal of vegetation and soil may impact on the watershed feeding the watercourses associated with the study area. | Medium | Low | |
| Surface water resource and environmental contamination may occur as a result of leakage of hydraulic fluid, fuel and oil from vehicles. In addition, chemicals transported by heavy vehicles may spill and reach nearby water resources. Similarly for concrete that is spilled. | Low | Low | |

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Impacts on physical and chemical surface water quality. | High | Low to Medium | |
| Altered wetland patterns may lead to impacts on the continuity of the riparian zone. Activities leading to increased disturbance of soils, release of pollutants and hence water pollution may cause water quality degradation. | High | Low to Medium | |
| Decrease in surface water catchment yield and water supply to downstream water users as a result of the containment of dirty storm water on site. | Low to Medium | Low | |
| Construction/Operational activities and heavy vehicles movement might result in compaction of the soil, increased runoff and reduced recharge of wetlands. | Medium | Low to Medium | |
| Increase in demand for potable water and sewage treatment facilities due to ingress of workers to the area as result of the project. | High | Medium | |
| Construction/Operational activities might result in impacts on wetland habitat integrity due to increase traffic during construction or additional personnel to the area. | Medium | Low to Medium | |
| Impact on wetland ecological and social services may occur as a result of the loss of biodiversity. In addition, the wetland may have a reduced ability in nitrate and toxicant removal. Loss of flood attenuation could also occur if the wetland is negatively impacted. | High | Low to Medium | |
| Direct loss of habitat and indirect loss through sedimentation and erosion could lead to the loss of riparian vegetation and biodiversity in terms of sensitive wetland dependent fauna and flora species. | High | Low to Medium | |

**Mitigation and Management during design and construction:**

» Obtain a Water Use License from the Department of Water Affairs and ensure compliance in terms thereof.
» Where possible maintain a 32m buffer around all riparian systems in line with the NEMA 2010 Regulations.
» Construct and maintain dirty containment infrastructure to divert all clean water around the site.
» Containment and diversion infrastructure must be able to contain / divert the 1:50 year rainfall event.
» Minimise construction footprint of the power plant and associated infrastructure to be located outside watercourses, wetlands and riparian zones.

- The plant evaporation dam must be appropriately constructed to avoid impacts on the Brugspruit confluence and associated wetlands.
- Disturbance to flow regimes must be minimised and erosion prevention measures must be implemented.
- A system of storm water drains must be designed and constructed to ensure that all water that falls outside the area of the stockpile and ash disposal facility is diverted. Provision must be made for the maximum precipitation to be expected over a period of 24 hours with a probability of once in one hundred years. A freeboard of at least 0.8 m must be provided throughout the system above the predicted maximum water level.
- Spillways generally are designed as temporary structures because they will change (i.e. be moved or increased in length) as raised embankments increase in height. They must be constructed of an impervious material able to withstand rapid flow velocities. The spillway also must be designed to contain and control hydraulic jumps that occur at the bottom of the spillway. In addition, a spillway design has to consider and plan for water treatment if the surface water runoff passes through the ash disposal facility or stockpile.
- All water that falls within the catchment area of the stockpile and ash disposal facility must be retained within the area. Water that has been in contact with coal material, and must therefore be considered polluted, must be kept within the confines of the power station until evaporated, treated until rendered acceptable for release, or re-used.
- Keep all demarcated sensitive zones outside of the construction area off limits during the construction/operational phase of the development.
- Implement measures to contain seepage from pollution sources.
- In the event that construction will occur within watercourses, wetlands and riparian zones, an offset strategy/rehabilitation plan must be compiled and adhered to. This is of particular relevance for the ash disposal facility.
- Minimise disturbance to flow regime and prevent erosion.
- Implement proper upstream storm water management to prevent clean water from entering the footprint area of the development.
- Construction / Decommissioning activities affecting watercourses or wetlands to take place in the dry season as far as possible.
- Keep area where topsoil is removed as small as possible and within the demarcated construction area.
- Minimise construction footprint to be outside watercourses, wetlands and riparian zones.
- Inspect vehicles regularly and repair them in designated areas.
- Place drip trays underneath all stationary heavy vehicles that have an oil / fluid leak.
- In the event that a toxic substance is spilled the Department of Water and Sanitation should be contacted.

» Rehabilitate area where spill has occurred immediately using the correct procedures as specified on the Material Safety Data sheet for the specific material.
» Ensure that the project information is provided to the Local Municipality to ensure that service provision is part of their infrastructure development plan.

**Mitigation during operations:**

» Other containment dams should be managed with a freeboard of 0.8 m.
» Where applicable, re-use water in dams before using raw water sources.
» All pollution control facilities must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs.
» Implement water conservation and water demand management strategies.
» Minimise disturbance to flow regime and prevent erosion.
» All hazardous chemicals must be stored on bunded surfaces and material safety data sheets should be present on site for all hazardous chemicals.
» Ensure that all spills are immediately cleaned up using the correct method as specified for the specific chemical / material.
» All pollution control facilities must be analysed for toxicity on at least three taxonomic groups using definitive screening acute toxicity testing methods at least once a year during the dry season.
» Allow wetlands to act as foraging and breeding habitat in order to maintain high levels of biodiversity through implementation of a wetland rehabilitation and management plan.
» Re-vegetate all disturbed areas with indigenous species having an affinity for riparian zones and wetland depressions.
» Surface water quality monitoring must be undertaken upstream and downstream of the project area on an ongoing basis to determine trends. Any significant change in quality from the previous results must be investigated and if the pollution originates on site an investigation as to the source of the pollution must be investigated and mitigation and rectifying measures implemented.
» Annually assess the integrity and status of the nearby wetlands and investigate any deterioration into the wetland condition. Should deterioration be observed, implement management and rehabilitation measures.
» Ongoing aquatic ecological monitoring must take place on a bi-annual basis to determine trends.

### *7.6.3 Comparison of Alternatives*

**Site and layout alternatives:** All site alternatives considered for the siting of the proposed project (other than alternative 5) are situated adjacent to watercourses (the Brugspruit). Site alternative 5 would be the preferred site in order to avoid the potential impacts on water resources, but as explained earlier

cannot be regarded as a viable site due to land use, ownership and technical constraints. Site 1 is situated at the confluence of the Brugspruit and its western tributary which is considered important in the area from a water quality maintenance perspective.

**Water Pipeline:** Both the EWRP and Highveld Steel water supply pipeline route options considered are situated parallel to existing roads for almost their entire length (and therefore impacts can be limited to the road servitude) and traverse the Brugspruit or its tributary on the approach to Transalloys. Both will have a similar impact on the Brugspruit; however the EWRP pipeline option will run parallel to the watercourse, with a higher potential for disturbance of the watercourse. From this perspective the water supply pipeline from Highveld Steel is preferred.

**Technology / layout alternative:** The 55MW power plant is preferred from a surface water perspective as less project infrastructure will be required to front on, or be developed adjacent to the Brugspruit, thereby decreasing the potential impact on water resources during construction and operational phases. Furthermore, the 55MW layout alternative will not impact directly on wetland resources delineated in the study area.

### *7.6.4 Implications for project implementation*

» The construction footprint in proximity to water resources must be minimised as far as possible. All components of the proposed power station and ash disposal facility have been designed to be located outside of the 1:100 year floodline of the Brugspruit and its western tributary, as well as associated wetlands. The water supply pipeline will however be required to traverse the western tributary of the Brugspruit.
» A Zero Liquid Effluent Discharge (ZLED) policy is required to be implemented to reduce the potential impact on water resource quality. Appropriately contain all water containing waste on site.
» Dry cooling technology to reduce water consumption at the power station is preferred due to size limitations and constraints in the supply of water within the region.

### *7.6.5 Conclusions and Recommendations*

The primary surface water impacts associated with the proposed Transalloys Power Plant are the potential impacts on the regional water balance, water quality degradation due to incidental waste and waste water discharges and storm water management at the proposed power plant area.

Stormwater management – A storm water management system should be designed for the Power Station site to ensure that sufficient storage capacity is created on site to accommodate storms with a 1:50 year return period. Spillage frequencies should be less than 1 percent, taking into account the long-term rainfall record applicable to the project site and any abstraction for reuse from the storm water dams. The stormwater management system should ensure that there is efficient separation of clean water and dirty water. Only clean water should be discharged to the storm water system. Contaminated water should be contained and treated on site.

The storm water management system should comply with the Department of Water Affairs' Best Practise Guidelines (DWAF, 2006). The EMP for the Power Station should also address measures to contain oil spills, good waste management practices, guidelines for the storage, handling, use and disposal of chemicals, etc.

Water use license - The proposed Transalloys Power Plant triggers various water uses that are subject to a water use authorisation in terms of section 40 of the NWA. The applicant must apply for a WUL in order to regulate the activity to minimise the impacts on the receiving water environment. A water use license application is currently in process.

## 7.7 Potential Impacts on Wetlands

### *7.7.1 Results of Impact Assessment*

**Wetland studies undertaken:** The delineated wetlands occurring in the study area were indicated in the Scoping Report based on a delineation undertaken by Grundling and Linstrom, 2012. This study was completed for Transalloys operational activities (i.e. not for the proposed power station) and did not consider the Present Ecological Status as per the minimum requirements of DWA. A wetland delineation inclusive of a Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) analysis was subsequently conducted by M2 Environmental Connections for the purposes of the EIA as part of the surface water assessment (refer to Appendix G).

**Wetlands identified:** Five wetlands of the Channelled Valley bottom and seepage variety were identified within the study area, four of which are in near proximity to the project site:

» Wetland 1 (Klipspruit and Brugspruit Confluence) – located in excess of 1km downstream of the project site.

» Wetland 2 (Brugspruit upstream) – An un-channelled valley bottom wetland including both natural and artificial flows from adjacent slag dumps.
» Wetland 3 (Brugspruit confluence) – is considered to be the most important wetland in the study area due to its water quality regulation function (toxicant and phosphate removal).
» Wetland 4 (Brugspruit at existing bridge).
» Wetland 5 (Brugspruit upstream).

**Wetland functionality and sensitivity:** Wetland functionality is defined as a measure of the deviation of wetland structure and function from its natural reference condition. In the current assessment the hydrological, geomorphological and vegetation integrity was assessed for the wetland unit associated with the study site in order to provide a Present Ecological Status (PES) score. In terms of the PES scores, the following health categories are described:

» A = Unmodified/natural;
» B = Largely natural with few modifications;
» C = Moderately modified;
» D = Largely modified;
» E = The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural features are still recognisable; and
» F = Modifications have reached a critical level.

The ecological importance of a water resource is an expression of its importance to the maintenance of ecological diversity and function on local and wider scales (regional, national). Ecological sensitivity refers to the system's ability to resist disturbance and its capability to recover disturbance once it has occurred. In terms of the Ecological Importance and Sensitivity (EIS) scores, only wetlands of moderate to low EIS are situated around the project site.

The PES and EIA scores for each of the identified wetlands and its relevance to the proposed project are indicated in Table 7.5. The location of the identified wetlands relative to the proposed project infrastructure is indicated in Figure 7.3.

**Table 7.5:** Summary of findings relevant to wetlands within the study area

| Wetland | Type | PES | EIS | Relevance to development |
|---|---|---|---|---|
| 1 | Channelled Valley Bottom | DEF | High | Downstream – indirectly affected by increased pressure due to upstream cumulative changes |
| 2 | Channelled Valley Bottom and Hillslope | Z3 | Low | Upstream – New pipeline will cross section of artificial zone |

| | | | | |
|---|---|---|---|---|
| | seep | | | |
| 3 | Channelled Valley Bottom | D | Moderate | Section of power plant footprint in buffer – direct impacts expected |
| 4 | Hillslope seepage | E | Low | Section of power plant footprint in buffer – indirect impacts expected |
| 5 | Hillslope seepage | E | Low | Footprint of proposed ash disposal facility situated in southern wetland extent. Rehabilitation needed. |
| Brugspruit River Channel | Channelled Valley Bottom | D | Moderate | Western tributary traversed by pipeline |

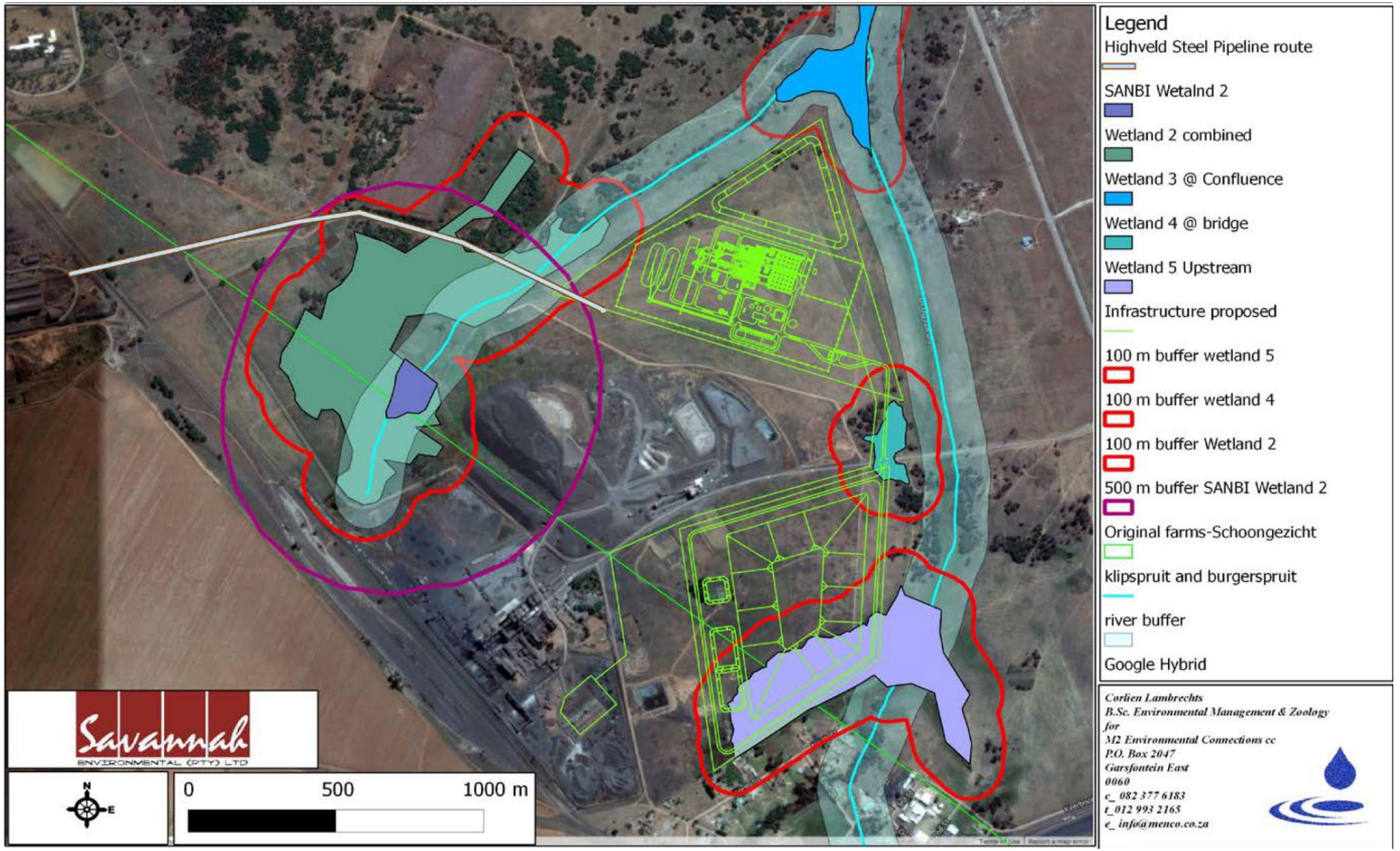



**Figure 7.3:** Delineated wetland areas within the project area relative to the proposed power station and associated infrastructure (150 MW alternative). The 55MW alternative would not infringe on any wetlands delineated in the study area and would be contained to the northern site (triangle).

### *7.7.2 Summary of Impact Assessment*

Table 7.6 provides the assessment of potential impacts on wetlands within the study area. More detail regarding the impacts and determination of significance is provided within the specialist wetland report contained in **Appendix H**.

In summary, the following key impacts on wetlands within the study area were identified in the wetland study:

» Impacts on aquatic integrity and water quality downstream.
» Impacts on wetland due to the construction of the proposed water supply pipeline (wetland 2).
» Impacts on a hillslope seep wetland (wetland 5) resulting from the construction of the proposed ash disposal facility over a section of the wetland.
» Physical impacts on wetland integrity at the Brugspruit confluence wetland (wetland 3)
» Cumulative impacts resulting from the above.

**Table 7.6:** Summary of impacts on Wetlands

| Potential impact | Significance without mitigation | Significance with mitigation | Mitigation |
|---|---|---|---|
| **PHYSICAL IMPACTS ON THE BRUGSPRUIT CONFLUENCE WETLAND INTEGRITY (WETLAND 3) DURING CONSTRUCTION** | | | |
| The construction activities might result in impacts to the wetland habitat integrity due to increased traffic and construction personnel to the area. Construction activities and heavy construction vehicles might result in physical degradation of the Brugspruit wetland. | Medium (negative) | Low (negative) | The construction activities may lead to the ultimate degradation of the drainage area where increased activity is expected through construction vehicles or other alterations which will result in riparian vegetation degradation and ultimate loss of aquatic ecosystem services. Decrease in wetland functioning and changes occurring will influence the wetland services offered by the wetland and decrease in aquatic integrity and water quality |
| Possible canalisation, erosion and changes in sediment entering the Brugspruit wetland due to changes in water flow amounts and sedimentation characteristics that may result in desiccation of certain areas through river diversions and drainage impacts on the project area. Construction activities may result in runoff being diverted and entering the system at unexpected points, causing increased erosion and culverts forming due to increases in velocity of water as it becomes more channelled | Low (negative) | Low (negative) | |
| Alien vegetation will increase in | Medium | Low | |

| Potential impact | Significance without mitigation | Significance with mitigation | Mitigation |
|---|---|---|---|
| numbers if not properly managed and due to their hardy nature penetrate the wetland areas due to loss of natural riparian zone and changes in the population numbers and community dynamics. | (negative) | (negative) | downstream of the Brugspruit. This will ultimately intensify the pressure on the Klipspruit wetland and lead to the degradation thereof. |
| Degradation and loss of plant coverage will lead to more solar penetration within the different water zones, impacting on primary production and phytoplankton within the system and an unbalance may establish within trophic levels of biodiversity leading to further degradation of the ecosystem. | Medium (negative) | Low (negative) | |
| Hydro-carbon spills from vehicles and other waste material used or generated during the construction phase will enter the wetland area and drain downstream degrading the water resource | Medium (negative) | Low (negative) | |
| **IMPACTS ON THE BRUSGSPRUIT WETLAND FROM PROPOSED ASH DISPOSAL FACILITY (WETLAND 5) DURING CONSTRUCTION** | | | |
| The construction activities might result in impacts to the wetland integrity due to construction of the ash disposal facility within the wetland zone. Constructing activities and heavy construction vehicles will result in physical degradation of the Brugspruit wetland. Compaction and other soil degradation activities are expected to occur within this designated zone where the ash disposal facility will be built within the wetland zone. | High (negative) | High (negative) | Consistent supply of water to the downstream Brugspruit area might be impacted and may have unwanted impacts on the downstream wetland systems. |
| Possible canalisation, erosion and changes in sediment entering the Brugspruit wetland due to changes in water flow amounts and sedimentation characteristics that may result in desiccation of certain areas through river diversions and drainage impacts on the project area. | High (negative) | Medium (negative) | |
| Alien vegetation will increase in numbers if not properly managed and due to their hardy nature penetrate the wetland areas (especially if degradation is present in some areas) due to loss of natural riparian zone and changes in the population numbers and community dynamics. | Medium (negative) | Low (negative) | Vegetation is already degraded in this wetland zone and management will be needed to maintain and improve its current status. |

| Potential impact | Significance without mitigation | Significance with mitigation | Mitigation |
|---|---|---|---|
| **IMPACTS ON THE BRUSGSPRUIT WETLAND IMPACTED BY PROPOSED PIPELINE CONSTRUCTION (WETLAND 2)** | | | |
| The construction activities are expected to result in unwanted impacts to the wetland habitat integrity due to increased traffic and construction personnel to the area. It is important to remember that this is an artificial system generated from tailings leakage and is not a natural system. | Medium (negative) | Medium (negative) | Constructing activities and heavy construction vehicles might result in physical degradation of the wetland. |
| Possible canalisation, erosion and changes in section that has been cleared and excavated for pipeline construction. | Medium (negative) | Low (negative) | After backfill, dongas and pooling of water in certain areas may become a tendency after construction. |
| Alien vegetation will increase in numbers if not properly managed and due to their hardy nature penetrate the wetland areas (especially if degradation is present in some areas) due to loss of natural riparian zone and changes in the population numbers and community dynamics. | Medium (negative) | Low (negative) | |
| **CUMULATIVE IMPACTS ON THE BRUGSPRUIT CONFLUENCE WETLAND INTEGRITY DURING OPERATIONS** | | | |
| Operational phase activities might result in prolonged impacts to the wetland habitat integrity due to increased traffic and constant personnel at the power plant and related infrastructure. Continuous replenishment of raw material to be used in the power generation process will increase activity at the site of operation. | High (negative) | Medium (negative) | All these small impacts accumulate to form bigger more pronounced impacts on the Brugspruit wetland system. Functioning of the wetland system will decrease over time and impacts will start to appear downstream of the wetland. |
| Possible accelerated erosion and changes in sediment entering the Brugspruit wetland due to changes in water flow amounts in the Brugspruit river system and possible operational water discharges from the Transalloys power plant | Medium (negative) | Medium (negative) | Long term effects on runoff patterns into the Brugspruit and related wetland at the confluence. |
| Alien vegetation will increase in numbers if not properly managed and due to their hardy nature penetrate the wetland areas (especially if degradation is present in some areas) due to loss of natural riparian zone and changes in the population numbers and community dynamics. | Medium (negative) | Low (negative) | Invasive and/or alien species will further decline natural vegetation and indigenous species by inter-and intra-competition increase. |

| Potential impact | Significance without mitigation | Significance with mitigation | Mitigation |
|---|---|---|---|
| **IMPACTS ON THE BRUSGSPRUIT WETLAND FROM PROPOSED ASH DISPOSAL FACILITY (WETLAND 5) DURING OPERATION** | | | |
| The operation of the ash disposal facility might result in impacts to the wetland integrity due to degradation of the wetland system over the long term and also increased risk of toxicity and risk of pollution entering the wetland and therefore the Brugspruit if such a spillage should occur at any stage of the operational phase. Fly ash that enters the air may also pollute the wetlands due to the extent of wetness present and act as a pollution facilitator. | High (negative) | Medium (negative) | All these small impacts accumulate to form bigger more pronounced impacts on the Brugspruit wetland system. Functioning of the wetland system will decrease over time and impacts will start to appear downstream of the wetland. |
| **IMPACTS ON AQUATIC INTEGRITY AND WATER QUALITY DOWNSTREAM** | | | |
| Irresponsible operational activities may lead to the ultimate degradation of the water resource. Decrease in wetland functioning and changes occurring will influence the wetland services offered by the wetland and decrease in aquatic integrity and water quality downstream of the Brugspruit. | Medium (negative) | Low (negative) | This will ultimately intensify the pressure on the Klipspruit wetland located further upstream and lead to the degradation thereof. |
| Loss of species diversity and wetland functioning due to fluctuations in water chemistry, toxicity of water, microbial growth and algal blooms, sedimentation of wetland vegetation habitats, sedge / aquatic macro-phyte can result in a loss of sensitive vegetation species and/or communities thus impacting on the diversity of the project area. | Medium (negative) | Low (negative) | |
| If coal ash and fly ash enter the systems, it may have detrimental results downstream and there is even risk of contamination of groundwater resources that is difficult, timely and expensive to treat effectively. Coal ash is filled with toxic levels of multiple pollutants—which can poison drinking water sources to a large are downstream. | High (negative) | Medium (negative) | |

**General mitigation measures for construction:**

» Install silt traps at designated areas to prevent sediment movement with runoff water.
» Appropriately design storm water measures to prevent runoff from the construction area directly into the wetland.

» Implement appropriate dust suppression practices, especially during the dry season.
» Implement erosion control measures at the construction sites and areas of exposed soil.
» Undertake re-vegetation and concurrent rehabilitation to protect exposed surfaces.
» Ensure appropriate management of local vegetation communities.
» Prevent introduction of new species through irresponsibly seeding and movement of soil from different areas (e.g. topsoils brought to site from other localities usually contain dormant seeds awaiting to germinate in ideal conditions).
» Protect local vegetation populations and numbers and when replanting, the sole use of indigenous vegetation is important.
» Ensure no harvesting or use of products from wetland and vegetation occurring in the wetland.
» Undertake constant monitoring of vegetation communities and implement measures to ensure quick response to problems detected.
» Ensure appropriate management of water quality entering the Brugspruit wetland system.

**Wetland 5 mitigation measures (150 MW power plant option):**

» Fence footprint area off to prevent any unnecessary access into the relevant wetland.
» Restrict all movement and construction activities to designated areas.
» Limit site clearance and damage only to footprint of ash disposal facility.
» Implement concurrent rehabilitation within the areas damaged during the construction activities.
» Install silt traps at designated areas to prevent sediment movement with runoff water.
» Ensure appropriately designed storm water measures to prevent runoff from the construction area directly into the wetland.
» Implement erosion control measures at the construction sites and areas of exposed soil.
» Undertake re-vegetation and concurrent rehabilitation to protect exposed surface.
» Manage local vegetation communities and prevent destruction.
» Remove alien species concurrently. Implement Alien invasive eradication plan to manage and eradicate alien species within and surrounding all wetlands delineated within the study area.
» Prevent introduction of new species by irresponsibly seeding and transporting and movement of soil from different areas (e.g. topsoils brought to site from other localities usually contain dormant seeds awaiting to germinate in ideal conditions).

» Species from wetland 4 (located just downstream) may be introduced in this zone which is currently degraded in terms of vegetation diversity.

**Pipeline construction mitigation measures:**

» Fence-off footprint area along the proposed pipeline in the area of the wetland to prevent any unintended access into the wetland.
» Restrict all movement to designated areas and use the roads that already exist within this area as access roads to different areas.
» Undertake concurrent rehabilitation and re-vegetation during construction should take place.
» Compile and work according to approved Work Method Statements.
» Implement rehabilitation programmes and restore free-draining surface or slightly concave surface of the covering soil to prevent pooling.
» Implement erosion control measures at the construction sites and areas of exposed soil.

**Operational phase mitigation measures:**

» Have operational policies in place prohibiting access to the Brugspruit wetland and the use of resources from the wetland.
» Fence off and maintain the buffer zone area to prevent any unlawful access into the sensitive area.
» Restrict all movement and activities to designated areas.
» Consider possibilities of pro-active responses at this stage, for example. rehabilitation of the downstream areas and wetland to increase capacity for absorbing impacts related to the Transalloys developments.
» Maintain silt traps at designated areas to prevent sediment movement with runoff water.
» Implement dust suppression practices, especially during the dry season.
» Implement erosion control measures at the construction sites and areas of exposed soil.
» Manage local vegetation communities and prevent destruction.
» Implement alien invasive management and eradication programmes.
» Focus on monitoring programme implementation and rehabilitation of areas that show changes in plant cover/open water relationship.
» Ensure no harvesting or use of products from wetland and vegetation occurring in the wetland.
» Undertake constant monitoring of vegetation communities and implement measures to ensure quick response to problems detected.
» Implement measures to manage water quality entering the Brugspruit wetland system.
» Ensure implementation of appropriate fly-ash management and pollution prevention.
» Implement the use of synthetic liners and leachate collection systems;

» Leakage/contaminant detection systems to be installed;
» Extensive monitoring systems and groundwater monitoring to be implemented.

### *7.7.3 Comparison of Alternatives*

**Site and layout alternatives for 150 MW power station:** Sites which do not have wetland characteristics are preferred from a development perspective, usually irrespective of the PES of the wetland. Sites 1, 3, 4 and 5 are thus preferred, while site 2 is not ideal due to wetland characteristics over a section of the site. However, as previously stated, due to factors governing land availability on the remaining sites and technical considerations, site 2 was selected for the construction of the ash disposal facility (for the 150 MW power station).

**Water Pipeline:** Both the EWRP and Highveld Steel water supply pipeline route options considered are situated parallel to existing roads for almost their entire length (and therefore impacts can be limited to the road servitude) and traverse the Brugspruit in close proximity to the project site. Both will have a similar impact on wetlands associated with the Brugspruit. However, the EWRP pipeline option will traverse a larger section of wetland and therefore have a higher potential for disturbance. From this perspective the water supply pipeline from Highveld Steel is preferred.

**Technology / layout alternative:** The 55MW power plant is preferred from a wetland impact perspective as none of the proposed infrastructure will impact directly on wetland 5, which would otherwise be impacted on by the ash disposal facility associated with the construction of the 150 MW power station.

### *7.7.4 Implications for project implementation*

» The most important wetland identified in the study area (wetland 3) is situated at the confluence of the Brugspruit and its western tributary to the north of the power plant. This wetland is avoided by the power plant. However the 100m buffer around the wetland should be observed as far as possible to avoid direct impacts to wetland 3 (refer to Figure 7.3).
» The southern section of the planned ash disposal facility (150 MW power station option) is situated within a section of an identified hillslope seep wetland (wetland 5) which will be lost to development (approximately 8ha).
» Construction of the ash disposal facility within a section of wetland 5 cannot be avoided for the 150 MW option. The environmental constraints within the site have partially served as a rationale for decreasing the size of the development footprint. The alternative layout discussed in Section 4.2 is preferred to limit the impact on wetlands.

» Wetland 5 is severely degraded currently and although impacts are expected to be high, potential for repair and rehabilitation is considered to be greater if exercised in terms of an established rehabilitation plan (for the 150 MW power station option).
» Any direct wetland impacts should result in suitable offsets or rehabilitation measures included in a rehabilitation plan for the wetlands surrounding the project site.

### *7.7.5 Conclusions and Recommendations*

Five wetlands associated primarily with the Brugspruit were identified in the study area, four of which are in near proximity to the project site. The 150 MW power station project, more specifically the ash disposal facility will result in direct and indirect impacts on a wetland delineated within the study area. While this impact has been determined to be acceptable if the mitigation measures are adhered to and the rehabilitation of the wetlands identified in the study area addressed within a wetland rehabilitation plan, the development of the 55MW power plant will avoid the wetland impacts, and is preferred on this basis.

Based on the findings of the current wetland assessment and the interaction of the proposed infrastructure layout with the wetlands, the following recommendations are made:

» The 55MW power station option is preferred to the 150 MW option as it avoids wetland impacts.
» The Water Use License application should apply for the destruction of the affected section of wetland and suitable offsets or rehabilitation measures included in a rehabilitation plan for the wetlands surrounding the project site.
» An appropriate liner system and stormwater management system should be designed to mitigate operational phase contamination of wetlands.
» All other wetlands around the project site can be avoided and suitable buffers maintained.

## 7.8 Potential Impacts on Groundwater

### *7.8.1 Results of Impact Assessment*

**Aquifers:** Two aquifers are present within the study area, namely a shallow weathered aquifer (ranging between 0 – 12m depth across the study area) and a deeper fractured rock aquifer. Aquifer test results suggest that the hydraulic conductivities of both aquifers are low. The weathered and fractured aquifers in the Transalloys smelter complex area both classify as minor aquifer systems (i.e. not a highly productive aquifer) and have to a certain extent already been

contaminated by current operations. The weathered aquifer remains vulnerable to further contamination.

**Boreholes:** There are 17 existing monitoring boreholes located within the study area drilled between 2005 and 2012 which are on average 30m deep and which form part of the existing Transalloys monitoring network. Some of the existing boreholes located on the site of the proposed ash disposal facility will need to be sealed to prevent cross contamination of the aquifers.

**Groundwater quality:** In general, the current groundwater quality is reasonable, but a few parameters are elevated. Manganese concentrations, in particular, tended to be high especially in the weathered aquifer. The number of parameters exceeded for groundwater are much less significant than for surface water (as shown earlier).

**Potential contamination sources and impacts:** Five main sources of potential groundwater contamination from the proposed power plant and ash disposal facility were identified. These include the ash disposal facility, the associated storm water run-off ponds, the zero discharge evaporation ponds, the coal and/or coal discharge stockpiles and other waste management facilities.

The impact on the groundwater regime found to be associated with the power station is potential pollution of the groundwater during the operation of the power station. The ash disposal facility and coal stockpile areas pose the biggest risk (moderate to high) to the downstream groundwater regime. Other sources include fuel and oil handling facilities, laboratory waste, bulk storage areas, sewage treatment plants and solid waste disposal areas. These impacts are anticipated if no liners are implemented below the stockpile and ash disposal facility at the site, or if the liners are leaking.

Ash disposal facility

A significant volume of ash will be generated by the combustion of the coal and coal discard and this will be disposed of in the ash disposal facility. The seepage and runoff water quality from the ash disposal facility will have been impacted to a certain extent by interaction with the ash. Power station ashes tend to be alkaline in nature and will most likely result in the generation of seepage and runoff water with elevated pH and as a resulted elevated concentrations of aluminium (due to the amphoteric nature of aluminium). In addition, there is potential for the leaching of other trace metals (e.g. iron, manganese, nickel, zinc and metalloids (e.g. selenium and arsenic) to impact on groundwater and surface water. The ash disposal facility will represent a risk to groundwater contamination when there is sufficient water in the disposal facility to seep into the groundwater system. The ash disposal facility runoff pond is likely to

represent a permanent operational risk to groundwater contamination as the pond is likely to have permanent standing water. The ash disposal facility is however expected to be lined which will minimise any potential risks to the environment.

Evaporation Pond

The zero discharge evaporation pond will be used to evaporate the wastewater from the process and produce a solid material for disposal. The evaporation process results in brine containing elevated concentrations of the parameters that were present in the wastewater. The brine from these facilities is usually highly concentrated in major ions such as sodium and chloride and as a result will have a high total dissolved solids concentration. In addition the brine can be elevated in metals/metalloids depending on what was present in the starting wastewater. As the evaporation process continues the brine crystallises to form a solid, highly concentrated in salts (e.g. sodium chloride) and potentially some metal/metalloids. While the brine is present in the ponds it represents a direct risk to groundwater contamination through seepage into the groundwater system. Once the brine evaporates to a solid, the solid material represents a risk to groundwater contamination should it be exposed to rainfall and leach into the groundwater system. Precipitation of solids in the evaporation pond is expected to be very minimal. The evaporation pond is expected to be lined and divided in two cells to allow each cell to be cleaned and maintenance performed on the liner approximately every 5 years. Disposal of solids from the evaporation pond is expected to be in the ash disposal facility or at a licensed off-site disposal facility.

Coal Stockpiles

The coal and coal discard used to fuel the Power Station will need to be stored on site in order to manage the demand for the Power Station. Currently the location of these stockpiles is proposed within the plant area. It is likely that the coal and coal discard for the Power Station will be sourced from the local area around Witbank. It is known that the coal discard from the Witbank area is often acid generating and can as a result leach out low pH water elevated in sulphates, total dissolved solids and metals/metalloids such as iron and manganese. To a lesser extent the raw coal product itself can also result in acidic leachate with elevated concentrations of sulphate and metals. Therefore the coal and coal discard stockpiles represent a risk in terms of groundwater contamination. It is expected that the coal discard stockpiles will be lined and that leachate collection systems will be installed which will mitigate the contamination risks associated with it.

» **Construction Phase:** The construction phase is not expected to influence the groundwater levels. With the exception of lesser oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality. This phase should thus cause very little additional impacts in the

groundwater quality.

» **Operational Phase:** The operational phase of the power station could potentially cause the most contamination or pollution of ground water, and mitigation measures will therefore be required. Seepage of pollutants through and around the stockpile and ash disposal facility is the main activity that can impact on ground water resources.

» **Impacts Indirectly Related to the Power Station:** During all phases of development of the power station, vehicles and personnel will be operative on site. Minor spills such as diesel, petrol and oil could results from machinery operations. In addition, domestic water and waste disposal could affect the groundwater quality.

### *7.8.2 Summary of Impact Assessment*

Table 7.7 provides a summary of the assessment of potential impacts on groundwater. More detail regarding the impacts and determination of significance is provided within the specialist report contained in **Appendix I**.

**Table 7.7:** Summary of impacts on Groundwater (all project components)

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Impact on groundwater quality and downstream groundwater regime resulting from the ash disposal facility and associated stormwater ponds | High | Low | Contamination of groundwater resulting in impact on other groundwater users. |
| Impact on groundwater quality and downstream groundwater regime resulting from the evaporation ponds | Medium | Low | |
| Impact on groundwater quality and downstream groundwater regime resulting from coal stockpiles | Medium | Low | |
| Impact on groundwater quality and downstream groundwater regime resulting from other hazardous wastes | Medium | Low | |
| Impact on groundwater quality and downstream groundwater regime resulting from other domestic wastes | Medium | Low | |

**Mitigation measures:**

The following mitigation measures are recommended to minimise impacts identified:

» Overall medium protection for the aquifers in the study area is required, which

will primarily include monitoring and implementation of the adequate design measures.

» Representative ash from a similar site should be tested for leaching characteristics under long term kinetic (otherwise known as humidity cell) leach testing to determine the potential contaminates of concern and their likely concentrations.
» The potential source materials should be geochemically characterised to assess the potential for contamination from seepage and runoff from the stockpiles. This should include Acid Base Accounting and long-term leach testing. The coal and coal discard stockpiles should also be lined and have suitable seepage collection systems to minimise the environmental impact.
» The likely water quality of the produced brine and crystallised solids should be estimated and their risk with respect to groundwater contamination. The pond should also be designed and lined to minimise seepage and prevent runoff.
» Additional mitigation measures guided by DWS's best practice guidelines of July, 2008 should also be implemented.

### *7.8.3 Comparison of Alternatives*

**Site and layout alternatives:** Groundwater flow within the study area is mainly controlled by the geology of the region and it is known that in these geological terrains the groundwater generally mimics the topography. The risk of groundwater contamination is largely a factor of the distance of the various site alternatives from the Brugspruit in which case site alternative 5 is preferred being the furthest from the Brugspruit.

**Water Pipeline:** There is no preference from a groundwater impact perspective for the selection of one water supply alignment over the other.

**Technology / layout alternative:** The 55MW power plant is preferred from a groundwater impact perspective as none of the proposed infrastructure will impact directly on surface wetlands, which contribute to the flow of groundwater within the site. No extension of the groundwater monitoring network will be required for this alternative.

### *7.8.4 Implications for project implementation*

» There are two major contamination pathways from the ash disposal facility and stockpile which are surface-runoff and seepage. Transalloys should continue with its surface water monitoring programme to ensure that it can characterise its impact on the Brugspruit and its tributary.
» The ash disposal site should be designed and lined to meet the required Waste

Act Regulations and Norms and Standards, and to effectively manage the potential environmental impact.

» Ash should be characterised during operations to determine the potential for contamination from contamination.

### *7.8.5 Conclusions and Recommendations*

The impact on the groundwater regime found to be associated with the proposed power station is potential pollution of the groundwater during the operation of the power station. The main sources of this pollution are the ash disposal facility and coal stockpile due to chemical weathering by oxidation of the sulphide containing minerals (mostly pyrite) in these structures, as well as other geochemical processes producing different contaminants. This is anticipated if no liners are implemented below the stockpile and ash disposal facility at the site, or if the liners are leaking. Mitigatory measures in the form of appropriately designed and maintained liners could prevent groundwater contamination. Other potential contamination sources include fuel and oil handling facilities, laboratory waste, bulk storage areas, sewage treatment plants and solid waste disposal areas.

The following recommendations are made:

» Transalloys should continue with its surface water monitoring programme to ensure that it can characterise its impact on the Brugspruit and its tributary.
» Material from the coal stockpile and ash disposal facility should be submitted for geochemical analysis to determine the leachability, acid generation capacity and contamination potential of each.

## 7.9 Potential Impacts on Air Quality

### *7.9.1 Results of Impact Assessment*

**Highveld Priority Area:** As a result of the concerns over the poor ambient air quality over the Highveld area, the Minister of Environmental Affairs declared a portion of Mpumalanga and Gauteng provinces an air quality priority area in November 2007. The proposed Transalloys Power Plant is located in the Mpumalanga Highveld and within the boundaries of the Highveld Priority Area (HPA), which is an area that has been identified as characterized with poor air quality. Power Generation activity in the HPA is the major source of $SO_2$ emissions (82%) and NOx emissions (73%) while it is only responsible for a relatively small contribution to the total $PM_{10}$ load (12%) (DEA, 2011b). The largest contributors to all three pollutants are power generation, residential fuel burning and motor vehicles. The lowest contributors to NOx, $SO_2$ and $PM_{10}$, according to DEA (2011b), are coal mines and motor vehicles.

The eMalahleni area is already elevated with respect to $PM_{10}$ and $SO_2$ concentrations and Baseline Hotspots for $SO_2$ and $PM_{10}$ have been identified. The project design should therefore also ensure minimal contribution to $SO_2$ and $PM_{10}$ concentrations. The results of the air quality simulations with respect to $SO_2$ and $PM_{10}$ are reflected in Figure 7.5 and Figure 7.6 respectively.

**Receiving environment:**

» The area is dominated by winds from the east and east-south-east. Long term air quality impacts are therefore expected to be the most significant to the west and west-north-west of the proposed site.
» The nearest Air Quality Sensitive Receptors (AQSRs) are Clewer, Lynnville and Kwa-Guqa. Clewer is immediately south of the existing Transalloys premises and the proposed ash disposal facility. Kwa-Guqa is situated north of the proposed project and could be impacted by emissions due to wind erosion from stockpiles and vehicle entrainment.

**Emission sources:** The quantity and nature of emissions from combustion of solids in boilers differs depending on the fuel composition, fuel consumption, boiler design and operation, and the emission and pollution control devices in use. Products of combustion of coal include sulphur dioxide ($SO_2$), oxides of nitrogen ($NO_X$), carbon monoxide (CO) and particulate matter (PM), acid gases and volatile organic compounds (VOCs). Metals and their compounds may also be entrained (i.e. carried forward by a stream of gas or vapour of fine liquid droplets). Carbon dioxide ($CO_2$) is significant with respect to greenhouse gases (GHGs).

The project is proposed to be constructed within an area where ambient air quality is affected by the existing Transalloys ferromanganese processing facility; coal mining activities to the east, south-east and south; and the activities of the EVRAZ Highveld Steel plant to the west. Ferrobank, an Industrial area hosting various manufacturing and processing plants, is situated within 5 km to the north east.

Sources of emissions from the proposed project quantified included crushing and screening, materials handling, vehicles travelling on unpaved and paved roads, windblown dust from stock piles and the ash disposal facility, vehicle exhaust and stack emissions.

Direct impacts will result from the inhalation of $NO_2$, $SO_2$ and particulates ($PM_{2.5}$ and $PM_{10}$) emitted during the operational life of the Transalloys Power Plant. Direct impacts will also result from exposure to dust generated from the coal stockpiles; and from the construction and decommissioning activities. Refer to Operational Phase below for further information.

With respect to cumulative impacts, the abovementioned sources contribute to the release of fugitive PM2.5, PM10 and TSP, as well as metallic and gaseous pollutants, which are products of the processing of ore and combustion of petrol, diesel and coal. It is therefore expected that there will be compounding of effects and hence cumulative impacts during operation of the Power Plant.

**Greenhouse gases:** Greenhouse gases – carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride ($SF_6$) – have been declared priority pollutants under Section 29(1) of the Air Quality Act (Government Gazette 37421 of 14 March 2014). The declaration provides a list of sources and activities including (i) fuel combustion (both stationary and mobile), (ii) fugitive emission from fuels, (iii) industrial processes and other product use, (iv) agriculture; forestry and other land use and (v) waste management. Proponents with GHGs footprint in excess of 0.1 Megatons or more, measured as $CO_2$ equivalent, are required to submit a pollution prevention plan to the Minister for approval.

The carbon footprint for the proposed Transalloys power project calculated is in excess of 100 000 tons $CO_2$ equivalent. The majority of this will come from boiler stack emissions during the coal burning process. However, the actual footprint of the proposed project can only be ascertained in a full carbon footprint assessment which will include the identification, documentation and assessment of GHG reduction and energy efficiency improvement opportunities, and the development of a GHG and energy efficiency action plan.

Potential impacts identified to be associated with the proposed project are expected during both construction and operation.

***Construction Phase***

Activities associated with this phase will comprise a series of activities including land clearing, topsoil removal, material loading and hauling, stockpiling, grading, bulldozing, compaction, etc. Each of these operations has its own duration and potential for dust generation. It is anticipated therefore that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. This is in contrast to most other fugitive dust sources where emissions are either relatively steady or follow a discernible annual cycle. It is therefore often necessary to estimate area wide construction emissions, without regard to the actual plans of any individual construction process.

The impact of dust is more of a nuisance nature and does not typically pose a health risk due to its typically coarse size. The impact of dust from the construction and decommissioning activities on air quality is expected to be relatively short lived, i.e. limited to the duration of the construction or decommissioning phases. The impacts are also expected to be localised and limited to the area adjacent to the activity.

It is not anticipated that the various construction activities would result in higher off-site PM ground level concentrations (GLCs) than the operational phase activities. The temporary nature of the construction activities, and the likelihood that construction activities will not occur concurrently, would reduce the significance of the potential impacts. Consequently, dispersion modelling was not undertaken for the construction phase of the Project.

***Operational Phase***

The impacts associated with the operational phases are assessed by the comparison of predicted ambient concentrations with the National Ambient Air Quality Standards. These are health based standards, i.e. ambient concentrations below the standards imply that air quality is acceptable while exposure to ambient concentrations above the standard implies that there is a risk to human health, particularly for sensitive individuals. The ambient standards for a given pollutant consist of a limit value and a permitted frequency of exceedance. The limit value is the fixed concentration level aimed at reducing the harmful effects of a pollutant. The permitted frequency of exceedance represents the tolerated exceedance of the limit value. Compliance with the standard therefore implies that ambient concentrations are below the limit value and the frequency of exceedance does not exceed the permitted tolerance.

The identification and quantification of emissions in the operational phase are divided into point sources and fugitive sources. Fugitive sources are defined as sources where the emission releases are not discharged to the atmosphere in a confined flow stream (US EPA, 1992).

The Transalloys Project is proposed to be spit in two distinct sections, namely the power generation site and the ash disposal facility. At the power plant, the main sources of emissions would be the stack releases (point source). Fugitive sources will include materials handling operations (loading, tipping and off-loading), conveyor transfer points, vehicle entrainment on internal roads, emissions from diesel engine exhaust, as well as wind erosion from exposed coal and limestone storage piles.

**Stack sensitivity:** A stack sensitivity study was undertaken using stack height varied at 60m, 100m, 125m, 150m, 175m and 200m. The result of this sensitivity evaluation concluded that, although impacts from the stack reduced with increasing height from 60m to 200m, the contribution of the impact to the overall plant impact is negligible. It is expected that the effect of stack sensitivity (between 100m and 200m) will therefore be insignificant and a stack height of 150m is therefore recommended for the 150MW project (with 65m being appropriate for the 55MW plant).

**Ash disposal facility:** At the ash disposal facility, the main sources of potential impact would be from the fugitive sources such as material handling operations, emissions from diesel engine exhaust, vehicle entrainment on internal roads, and wind-blown dust.

Estimated annual average emissions, per source group, are presented in Table 7.8. The contributions of each source group's emissions to the total are graphically presented in Figure 7.4.

**Table 7.8:** Estimated Annual Emission rates per source group

| Estimated Annual Emissions (tpa) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Source Groups** | **$PM_{2.5}$** | **$PM_{10}$** | **TSP** | **CO** | **$SO_2$** | **NOx as $NO_2$** | **VOC** |
| Stacks | 418.29 | 418.29 | 418.29 | - | 4182.90 | 6274.35 | - |
| Crushing | 0.39 | 0.77 | 4.11 | - | - | - | - |
| Materials Handling | 0.38 | 2.54 | 5.37 | - | - | - | - |
| Paved Roads | 20.28 | 83.82 | 436.68 | - | - | - | - |
| Unpaved Roads | 2.30 | 23.02 | 106.37 | - | - | - | - |
| Wind Erosion | 179.28 | 305.01 | 389.14 | - | - | - | - |
| Vehicle Exhaust | 5.38 | 5.85 | - | 37.48 | 0.06 | 90.14 | 4.84 |
| Diesel Engines | 0.01 | 0.01 | - | 0.06 | 0.00 | 0.23 | 0.01 |
| **Total** | **626.31** | **839.30** | **1359.95** | **37.54** | **4182.96** | **6364.72** | **4.84** |

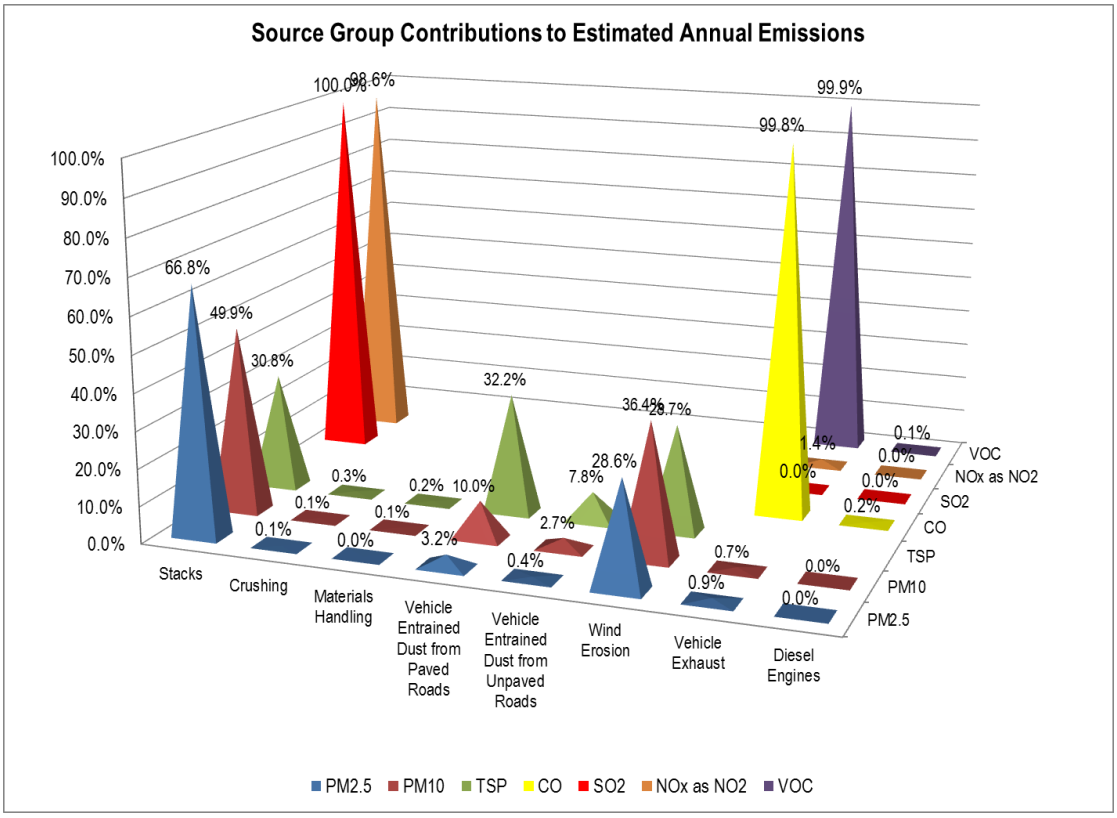



**Figure 7.4:** Screening of Simulated Human Health Impacts (Incremental and Cumulative)

The simulated $PM_{2.5}$, $PM_{10}$, $NO_2$ and $SO_2$ isopleth plots at the nearby Air Quality Sensitive Receptors (AQSR) are provided in the specialist air quality study (Appendix J). Isopleth plots reflect the incremental GLCs for $PM_{2.5}$, $PM_{10}$, $NO_2$ and $SO_2$. In summary, the following is a summary of the isopleth simulations during operations:

» **$PM_{2.5}$ concentrations:** Simulated annual average off-site $PM_{2.5}$ GLCs are below the standard at nearby AQSR (Clewer, Kwa-Guqa and Lynnville). The 4-day per year frequency of exceedance (FOE) of the SA NAAQS was exceeded for about 1 km to the north, north east and northwest of the proposed plant site. This results in exceedance at the Kwa-Guqa boundary (5 days), but not at Clewer and Lynnville (2 days and 1 day respectively). It should be noted that the $PM_{2.5}$ modelling assumes that all PM emitted from the stack are $PM_{2.5}$.

» **$PM_{10}$ concentrations:** Simulated annual average off-site $PM_{10}$ GLCs are below the standard at nearby AQSRs (Clewer, Kwa-Guqa and Lynnville). The 4-day per year permissible FOE of the SA NAAQS was exceeded for about 1 km to the north, north east and northwest of the proposed project site. This results in exceedance at the Clewer boundary (35 days), Kwa-Guqa boundary (5 days); but not at Lynnville boundary (1 day).

- **$NO_2$ Concentrations:** Simulated annual average off-site $NO_2$ GLCs are below the standard at nearby AQSR (Clewer, Kwa-Guqa and Lynnville). The 88-hour per year permissible FOE of the SA NAAQS was exceeded for about 2 km to the northwest of the proposed project site. This results in exceedance at the Clewer boundary (108 hours), but not at KwaGuqa and Lynnville (65 and 0 hours respectively).
- **$SO_2$ Concentrations:** Simulated annual average off-site $SO_2$ GLCs are below the standard at nearby AQSR (Clewer, Kwa-Guqa and Lynnville). The 4-day per year FOE of the SA NAAQS was not exceeded at any of the AQSR, as well as at the proposed plant boundary.
- **Dustfall:** Simulated daily maximum off-site dustfall deposition rates are below the residential limit at Kwa-Guqa and Lynnville. The residential and non-residential limits are exceeded at the north boundary of Clewer, adjoining the ash disposal facility. Exceedance is also observed to the northwest of the proposed plant, stretching as far as about 1.5 and 1 km for residential and non-residential limits respectively.

Due to the location of the project within the HPA, the project should ensure minimal contribution to $SO_2$ and $PM_{10}$ concentrations. The graphical results of the air quality simulations with respect to $SO_2$ and $PM_{10}$ are reflected in Figure 7.5 and Figure 7.6 respectively with further graphical results illustrated in the air quality specialist report in Appendix J. Note that these results are with respect to the larger 150MW plant and a much reduced impact for the 55MW plant is anticipated.

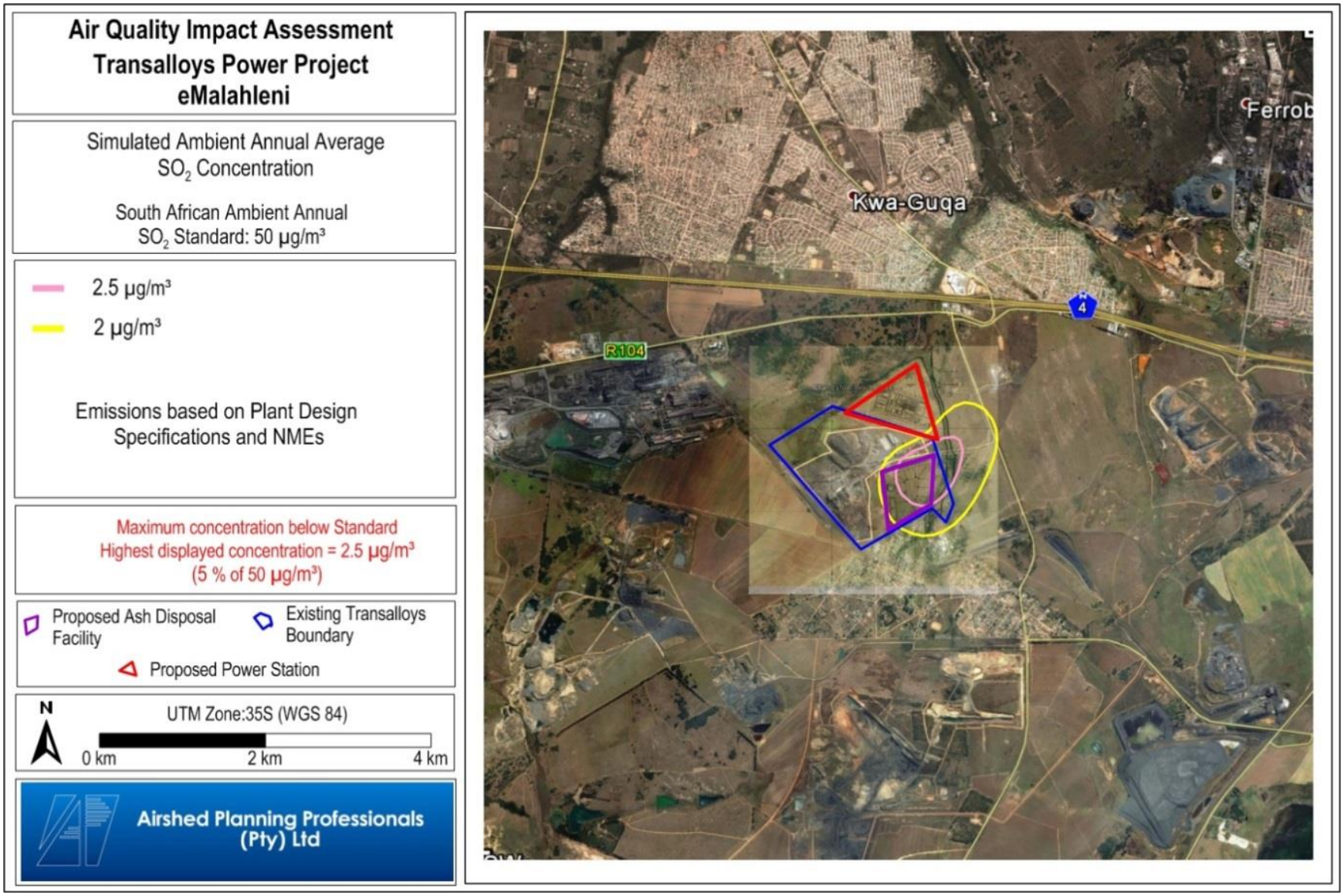



**Figure 7.5:** Simulated annual average ground level $SO_2$ concentration

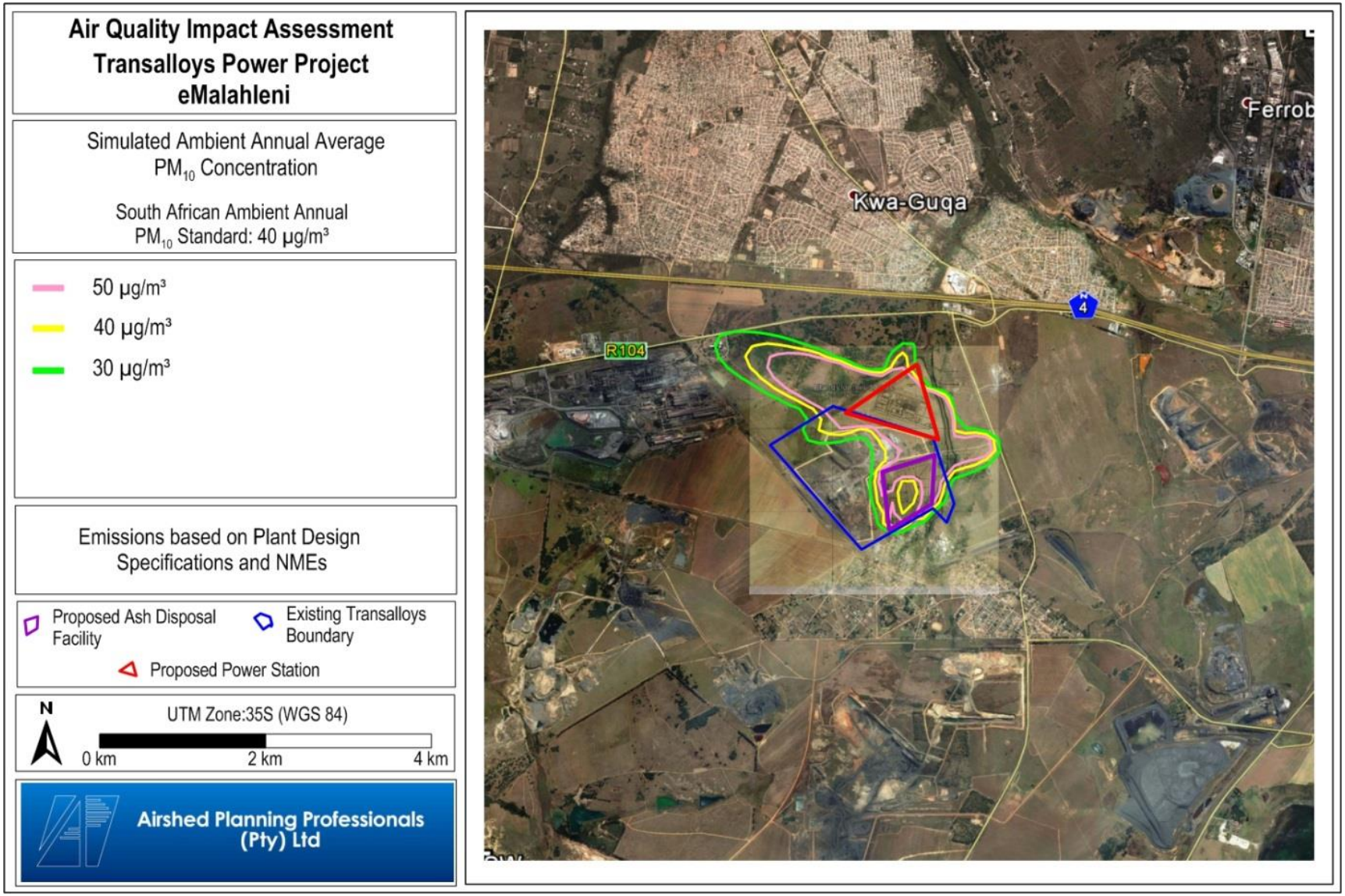



**Figure 7.6:** Simulated annual average ground level $PM_{10}$ concentration

### *7.9.2 Summary of Impact Assessment*

Table 7.9 provides a summary of the assessment of potential impacts on air quality and human health. The assessment considered the impacts associated with:

» Construction – qualitative;
» Operations – using dispersion modelling for normal operations for coal stockpile, ash disposal facility and stack height of 150m.
» Cumulative – qualitative;
» Decommissioning – qualitative.

The additive, or cumulative effects, of emissions from the project to the existing ambient concentrations are not modelled. Rather typical background concentrations of respective pollutants are considered when assessing modelled concentrations resulting from the Transalloys Power Station in isolation.

**Table 7.9:** Summary of impacts on Air Quality and Human Health (all project components)

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Activity: Construction/closure phase activities - All construction/ closure activities that result in fugitive PM and gaseous pollutant emissions (including topsoil scraping, blasting, bulk earthworks, demolition etc.)<br><br>Potential impact: Increased ambient pollutant concentrations and dustfall rates. (Note: Qualitative Assessment) | Low (negative) | Low (negative) | The proposed construction/ closure activities will contribute to the baseline pollutant footprint. By qualitative assessment, the post-mitigation increase in impact is expected to be 'low'. |
| Activity: Operational phase activities - All operational activities that result in $PM_{2.5}$ emissions including transport, processing and power generation<br><br>Potential impact: Increased ambient pollutant concentrations and dustfall rates. (Note: Qualitative Assessment) | Medium (Negative) | Medium (negative) | The proposed operational activities will contribute to the $PM_{2.5}$ baseline footprint. Qualitative assessment indicates that the pre- and post-mitigation increase in impact is expected to be 'medium'. |
| Activity: All operational activities that result in PM10 emissions including transport, processing and | High (Negative) | Medium (negative) | The proposed activities will contribute to baseline $PM_{10}$ levels in the area. Impacts |

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| power generation<br><br>Potential impact: Increased ambient $PM_{10}$ concentrations. | | | within the existing and proposed Transalloys premises are expected to significantly increase and exceed the 2015 NAAQS limit. $PM_{10}$ impacts in Clewer and surroundings will also increase, but the pre- and post-mitigation increase in impact is weighted 'medium'. |
| Activity: All operational activities that result in $NO_2$ emissions including transport, processing and power generation<br><br>Potential impact: Increased ambient $NO_2$ concentrations. | Medium (Negative) | Medium (negative) | The proposed activities will contribute to the $NO_2$ footprint in the area. By qualitative assessment, increase in impact is expected to be medium. |
| Activity: All operational activities that result in $SO_2$ emissions including transport, processing and power generation<br><br>Potential impact: Increased ambient $SO_2$ concentrations. | Medium (Negative) | Medium (negative) | The proposed activities will contribute to the $SO_2$ footprint in the area. By qualitative assessment, increase in impact is expected to be medium. |
| Activity: All operational activities that result in dustfall deposition including transport, processing and power generation<br><br>Potential impact: Increased ambient dustfall deposition rates. | Medium (Negative) | Low (negative) | The proposed activities will contribute to the dustfall impacts in the area. Dustfall impacts within the existing and proposed Transalloys premises are expected to significantly increase and exceed the non-residential limit. Dustfall impacts in Clewer and the immediate area will also increase, but the pre-mitigation impact is expected to be medium, while the post-mitigation increase in impact is expected to be 'low'. |

The following is apparent from the assessment of impacts:

- The release of $PM_{2.5}$, $PM_{10}$ and $NO_2$ during the operational phase are expected to result in exceedances of both long term (annual) and short term (1-hour and/or 24-hour) ambient air quality criteria off-site. When unmitigated, a significance weighting of 'medium' is assigned to potential inhalation health impacts associated with $PM_{2.5}$, $PM_{10}$ and $NO_2$.
- Dustfall as a result of unmitigated PM emissions is expected to exceed the criteria for residential areas at the closest residences of Clewer. An impact significance rating of 'medium' is assigned. With basic mitigation

measures in place to suppress fugitive dust, the impact significance rating reduced to 'low'.

» Simulated CO, $SO_2$ and VOC concentrations are very minimal with impact significance ratings expected to be 'low".

**Mitigation measures:**

The main objective of the proposed air quality management measures for the Project is to ensure that operations result in ambient air concentrations (specifically PM2.5, PM10 and NO2) and dustfall rates remain within the relevant ambient air quality standards at Clewer, Kwa-Guqa and other off-site areas.

Ambient monitoring could be enforced as part of the conditions of emission licenses by local authority under the NEMAQA. The recommended management plan includes:

» The mitigation of sources of major emission;
» The management of associated air quality impacts;
» Ambient air quality monitoring; and
» The implementation of an air quality buffer zone.

**Emissions:** It is recommended that a stack emission measurement campaign be conducted once the proposed power project is fully operational. This is to confirm that the emissions fall within their required standards.

**Monitoring:** The Transalloys monitoring network should be extended to Kwa-Guka, an AQSR to the north of Transalloys. PM10, and PM2.5 ground level concentrations as well as dustfall rates should be monitored continuously. Passive sampling of $NO_2$ should also be undertaken periodically. With the proposed project located within the Highveld Priority Area where the background concentrations of PM10 and $SO_2$ are already elevated, it is recommended that the management plan for the Highveld Priority Area be included in all management plan proposed for the project.

**Buffers:** Adverse PM10, PM2.5, and $NO_2$ incremental impacts from the proposed Transalloys project are expected to occur. This is due to the location of emissions sources such as stockpiles, vehicle entrainment and vehicle exhaust sources close to the northern boundary. The implementation of a buffer zone extending approximately 300m north, north-west and north-east of the proposed Transalloys power station boundary is proposed.

### *7.9.3 Comparison of Alternatives*

**Site and layout alternatives:** Based on the results of the air quality specialist study simulations undertaken, and the close proximity of the alternative sites to

one another, the simulated dispersion results are not expected to be significantly different with only slight variations in exceedances experienced at the AQSR.

**Water Pipeline:** There is no preference from an air quality perspective affecting the alignment of the water supply pipeline.

**Technology / layout alternative:** The 55MW power plant is preferred from an air quality impact perspective over the 150MW plant due to smaller footprint, thereby allowing the entire footprint of the power plant and ash disposal facility to be located on Site 1, which is situated further away Clewer. As no ash disposal facility will be required to be constructed on Site 2 (which is situated near to Clewer), the impact of potentially adverse air quality on nearby sensitive receptors due to potential exceedences in dustfall and other parameters will be mitigated to a much greater extent.

### *7.9.4 Implications for project implementation*

- Adverse $PM_{10}$, $PM_{2.5}$, and $NO_2$ incremental impacts from the proposed Transalloys project are expected to occur to the north, north-west and north-east of the proposed Transalloys power station boundary. This is due to the location of emissions sources such as stockpiles, vehicle entrainment and vehicle exhaust sources close to the northern boundary. The implementation of an air quality buffer zone extending about 300m north, north-west and north-east of the proposed Transalloys power station boundary is therefore recommended.
- The development of a 55MW power station as opposed to the 150MW alternative will serve to mitigate many of the anticipated air quality impacts.
- To ensure the lowest possible impact on Clewer, Kwa-Guqa and the environment, it is recommended that an air quality management plan be adopted.
- Carbon footprint (direct emissions only) calculated for the proposed Transalloys power project was in excess of the 100 000 tons $CO_2$ equivalent, beyond which a pollution prevention plan is required to be submitted to the Minister of Environment (for the 150MW project). However, the actual footprint of the proposed project can only be ascertained in a full carbon footprint assessment which will include the identification, documentation and assessment of GHG reduction and energy efficiency improvement opportunities, and the development of a GHG and energy efficiency action plan.

### *7.9.5 Conclusions and Recommendations*

The main findings of the air quality assessment are:

Receiving environment:

- The area is dominated by winds from the east and east-south-east. Long term air quality impacts are therefore expected to be the most significant to the west and west-north-west of proposed operations.
- Ambient air pollutant levels in the proposed Project area are currently affected by the following sources of emission: the existing Transalloys ferromanganese processing facility; mining activities to the east, south-east and south; and a steel processing plant to the west. Ferrobank, an Industrial area hosting various manufacturing and processing plants, is situated about 5 km to the north east.
- Pollutants released in the region include but are not limited to, fugitive $PM_{2.5}$, $PM_{10}$ and total suspended particles, as well as metallic and gaseous pollutants, which are products of the processing of ore and combustion of petrol, diesel and coal.
- The nearest AQSRs are Clewer, Lynnville and Kwa-Guqa. Clewer is located immediately adjacent to the existing Transalloys premises and the proposed ash disposal facility. Kwa-Guqa is situated north of the proposed project and will be impacted by emissions due to wind erosion from stockpiles and vehicle entrainment.

Impacts during construction/closure phases:

- Construction and closure phase emissions were not quantified since, as for most power projects, they are expected to be less than emissions during the operational phase and would be of short duration. When unmitigated, the significance rating of the construction phase 'low to medium'. With basic mitigation measures in place i.e. dust suppression, it can be reduced to 'low'.

Impacts during operational phase:

- Sources of emissions quantified included materials handling, vehicles travelling on unpaved and paved roads, windblown dust from stockpiles and the ash disposal facility, vehicle exhaust and stack emissions.
- Operational phase PM emissions ($PM_{2.5}$, $PM_{10}$ and TSP) and gaseous emissions (CO, NOx, $SO_2$ and VOC) were quantified and used in simulations.
- The release of $PM_{2.5}$, $PM_{10}$ and $NO_2$ during the operational phase are expected to result in exceedances of both long term (annual) and short term (1-hour and/or 24-hour) ambient air quality criteria off-site. When unmitigated, a significance weighting of 'medium' is assigned to potential inhalation health impacts associated with $PM_{2.5}$, $PM_{10}$ and $NO_2$.
- The study assumed some basic fugitive dust mitigation measures (mostly dust suppression) to reduce PM emissions. Whereas the impact

significance associated with $PM_{2.5}$ and $PM_{10}$ may reduce, the significance still indicates a 'medium' weighting. The impact significance of dustfall however reduces to 'low'.

- » Dustfall as a result of unmitigated PM emissions is expected to exceed the criteria for residential areas at the closest residences of Clewer. An impact significance rating of 'medium' is assigned. With basic mitigation measures in place to suppress fugitive dust, the impact significance rating is reduced to 'low'. This is further mitigated if the 55MW alternative is developed resulting in the site adjacent to Clewer not being required for development of the ash disposal facility.
- » Simulated CO, $SO_2$ and VOC concentrations are very minimal with impact significance ratings expected to be 'low".
- » Additional impacts due to upset conditions are also expected to be insignificant. The impact contribution due to upset conditions is expected to be negligible when compared to the overall plant impacts. Thus, impacts during upset conditions will be similar to normal conditions.
- » Carbon footprint (direct emissions only) calculated for the proposed Transalloys power project (150MW alternative) was in excess of the 100 000 tons $CO_2$ equivalent, beyond which a pollution prevention plan is required to be submitted to the Minister of Environment. However, the actual footprint of the proposed project can only be ascertained in a full carbon footprint assessment which will include the identification, documentation and assessment of GHG reduction and energy efficiency improvement opportunities, and the development of a GHG and energy efficiency action plan.

To ensure the lowest possible impact on Clewer, Kwa-Guqa and the environment, it is recommended that an air quality management plan be adopted. The recommended management plan should include:

- » The mitigation of sources of major emission;
- » The management of associated air quality impacts;
- » Ambient air quality monitoring; and
- » The implementation of an air quality buffer zone extending approximately 300m north, north-west and north-east of the proposed Transalloys power station boundary.

Also, with the proposed project located within the Highveld Priority Area where the background concentrations of $PM_{10}$ and $SO_2$ are already elevated, it is recommended that the management plan for the Highveld Priority Area be included in all management plans proposed for the project.

It is further recommended that a stack emission measurement campaign be conducted once the proposed power project is fully operational to confirm that the emissions fall within the required Minimum Emissions Standards.

## 7.10 Potential Noise Impacts

### *7.10.1 Results of Impact Assessment*

Ambient sound levels in the area were determined to be very high, generally exceeding the night-time sound level limit of 45 dBA set by the World Health Organization. Night-time ambient sound levels are reminiscent of a Central Business District at 55 dBA at two measurement locations. Other measurement locations also indicate an area where the soundscape has been altered by mining, industrial and transport activities.

Considering the noise emissions from a number of conceptual activities, this assessment indicated a potential for a noise impact during the construction phase, but this impact would be of low significance. This relates to both the day and night-time scenarios. This is mainly due to the existing high ambient sound levels measured in the area.

***Construction Phase***

Potential noise sources resulting from the development of the proposed power station during the construction phase include:

» Development of access roads,
» Site establishment (contractors camp, equipment and material storage, security and access control, security fence)
» Vegetation and topsoil removal,
» Establishment of the ash disposal facilities,
» Establishment of storage (coal stockpile footprints) facilities,
» Construction of infrastructure (foundations to completed structures)

**Noise modelling:** A worst-case scenario for the construction phase was assessed whereby the noise generating activities are operating under load simultaneously. This is illustrated in Figure 7.7 in which the following assumptions are made:

» Existing noise contributors were not considered due to the complex soundscape in the area. Existing noise contributors can only be used after a study was completed to define the contribution from the different noise sources of each of the potential contributors.

- A basic correction for equipment that is assumed to be in buildings (or surrounded by cladding). Cladding considered to be 1.6 mm galvanized steel sheets.
- Road traffic is not considered as the additional traffic will not change the ambient sound levels significantly. This is because an increase of 20% more vehicles would have an effect of less than 2 dB.
- Due to the existing high ambient sound levels it is also unlikely that the addition of a conveyor belt will change the noise levels significantly. It should be noted that if such a conveyor belt is developed within 500 meters from any potential noise-sensitive receptor, the potential noise impact should be evaluated.
- Intervening ground conditions are of a medium-hard ground nature, i.e. no dense flora etc. (acoustically 50% absorbent).
- Activities are undertaken during wind-still conditions, in good sound propagation conditions (20$^{o}$C temperature and 80% humidity for the night).

The abovementioned worst-case scenario (as illustrated in Figure 7.7) was modelled with the output presented in Figure 7.8 (projected total noise rating). The worst case scenario was presented with all the activities taking place simultaneously.

**Noise sensitive developments:** Potential receptors in and within approximately 1 000 meters around the proposed project were identified as NSD01 to NSD10 situated at the northern periphery of Clewer Agricultural Holdings (indicated in Figure 7.8 and Figure 7.10). These receptors are just indicative of the surrounding community representing the closest dwellings, as there are significantly more people staying in the Clewer area.

**Blasting:** Blasting may be required as part of the civil works to clear obstacles or to prepare open casts. However, blasting will not be considered during the EIA phase for the following reasons:

- Blasting is highly regulated, and control of blasting to protect human health, equipment and infrastructure will ensure that any blasts will use the minimum explosives and will occur in a controlled manner. The breaking of obstacles with explosives is also a specialized field and when correct techniques are used, causes significantly less noise than using a rock-breaker.
- People are generally more concerned over ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast. However, these are normally associated with close proximity mining/quarrying.

Blasts are infrequent occurrences with a loud but a relative instantaneous character. Potentially affected parties generally receive sufficient notice (siren)

and the knowledge that the duration of the siren noise as well as the blast will be over relatively fast, result in a higher acceptance of the noise. Note that noise from blasting can be controlled with the use of correct blasting methods.


**Figure 7.7:** Aerial image indicating potentially noise-sensitive receptors relative to the proposed power station and ash disposal facility footprint indicating conceptualised construction activities (scenarios)

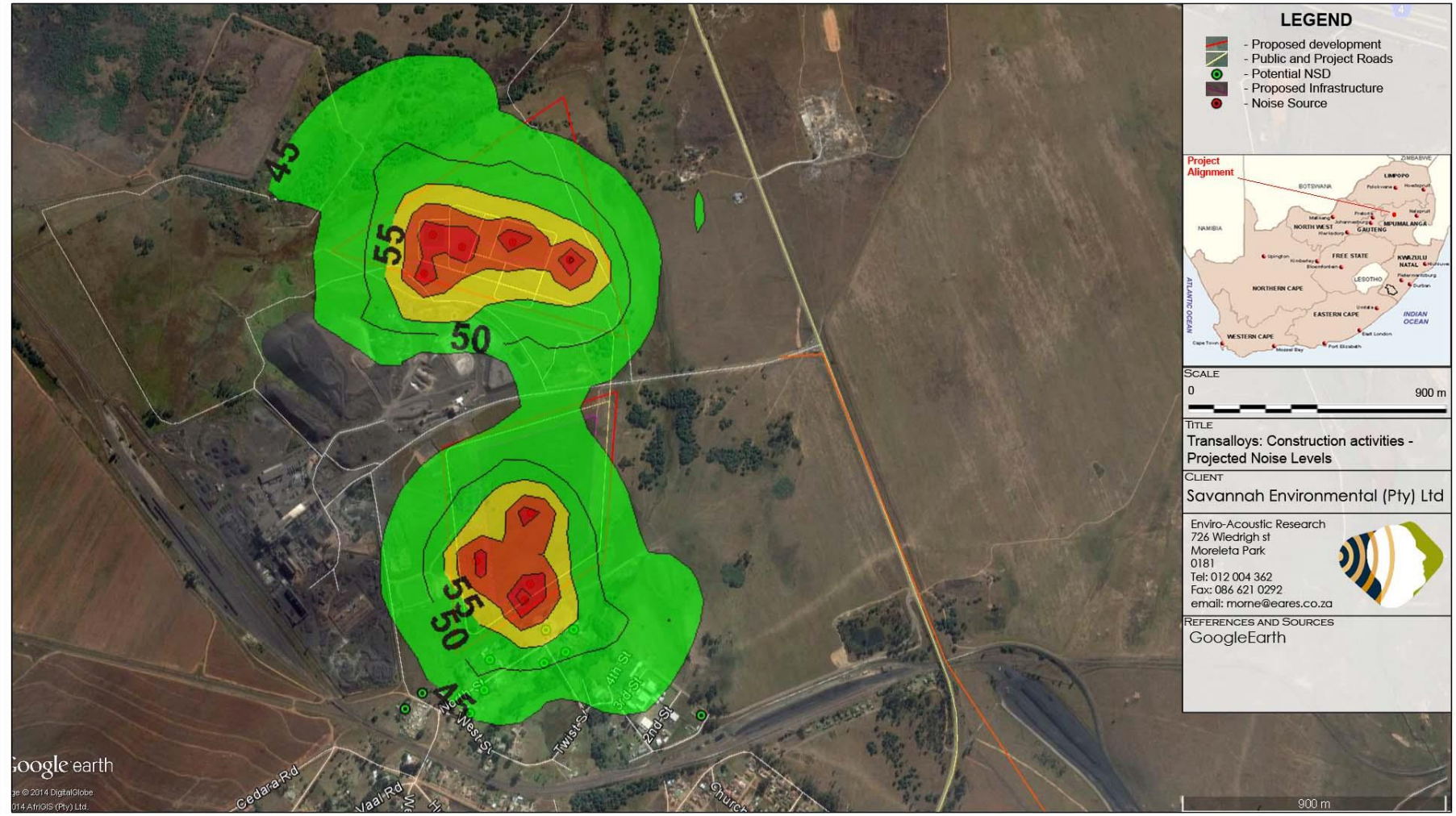



**Figure 7.8:** Construction noise - Contours of constant rating levels

***Operation Phase:***

The main source of noise associated with the operation of the proposed power plant is associated with the intake and cooling fans, as well as material handling activities at the coal stockpile. Coal pulverising (if required), boilers, steam turbines and generators are generally constructed within fixed structures that will attenuate the noise from this equipment. Noise from ancillary services and activities such as pumps (boiler feed, water, chemical, condensate, vacuum), air compressors and onsite traffic generally is far less than the noise from the main sources.

Traffic during the operational phase will mainly be limited to workers and contractors travelling around the site, traffic associated with shift changes and traffic associated with the delivery of coal and limestone to the site. The assessment also indicated that there is a low potential of a noise impact during the operational phase.

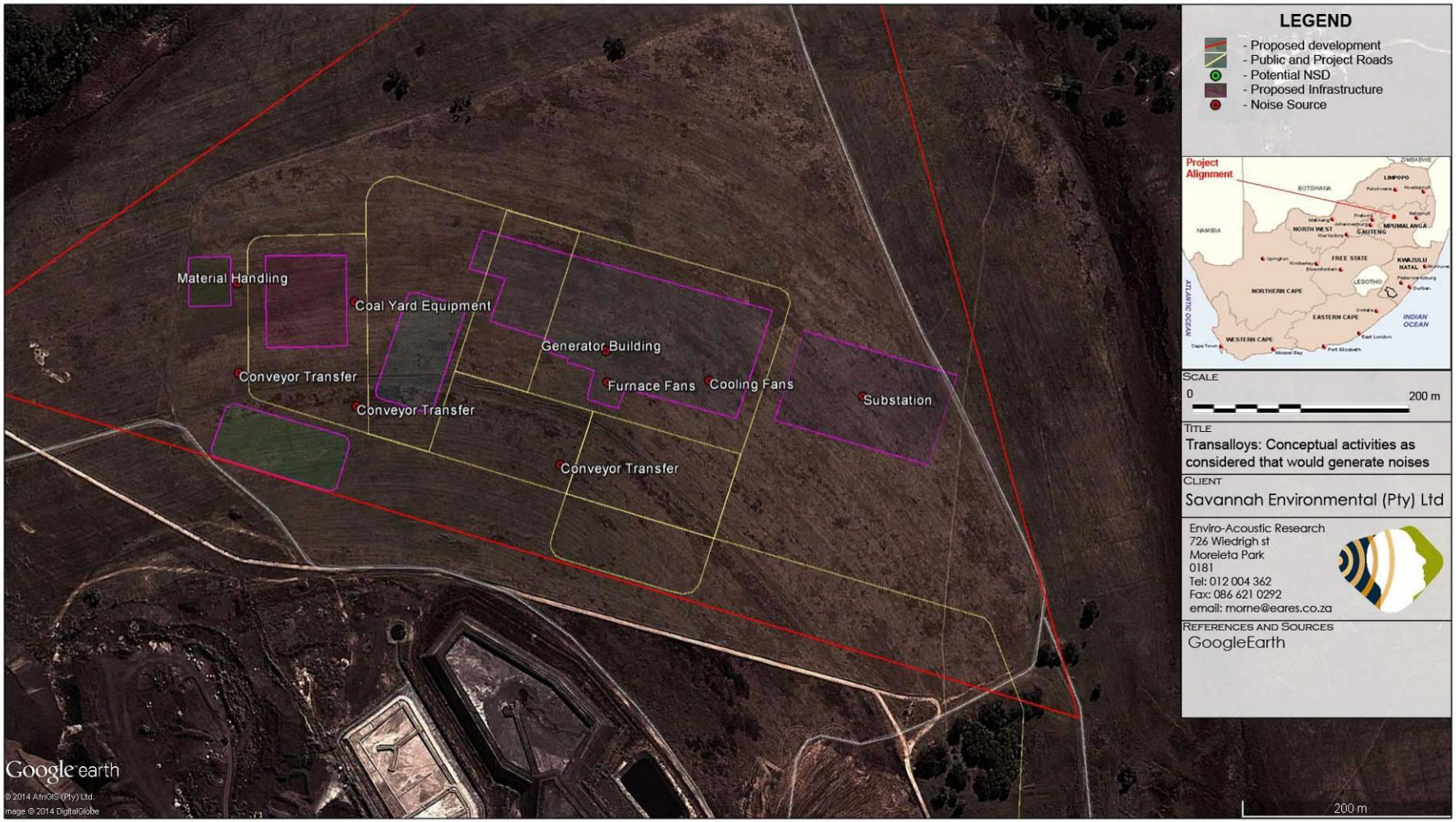



**Figure 7.9:** Conceptual layout of operational activities

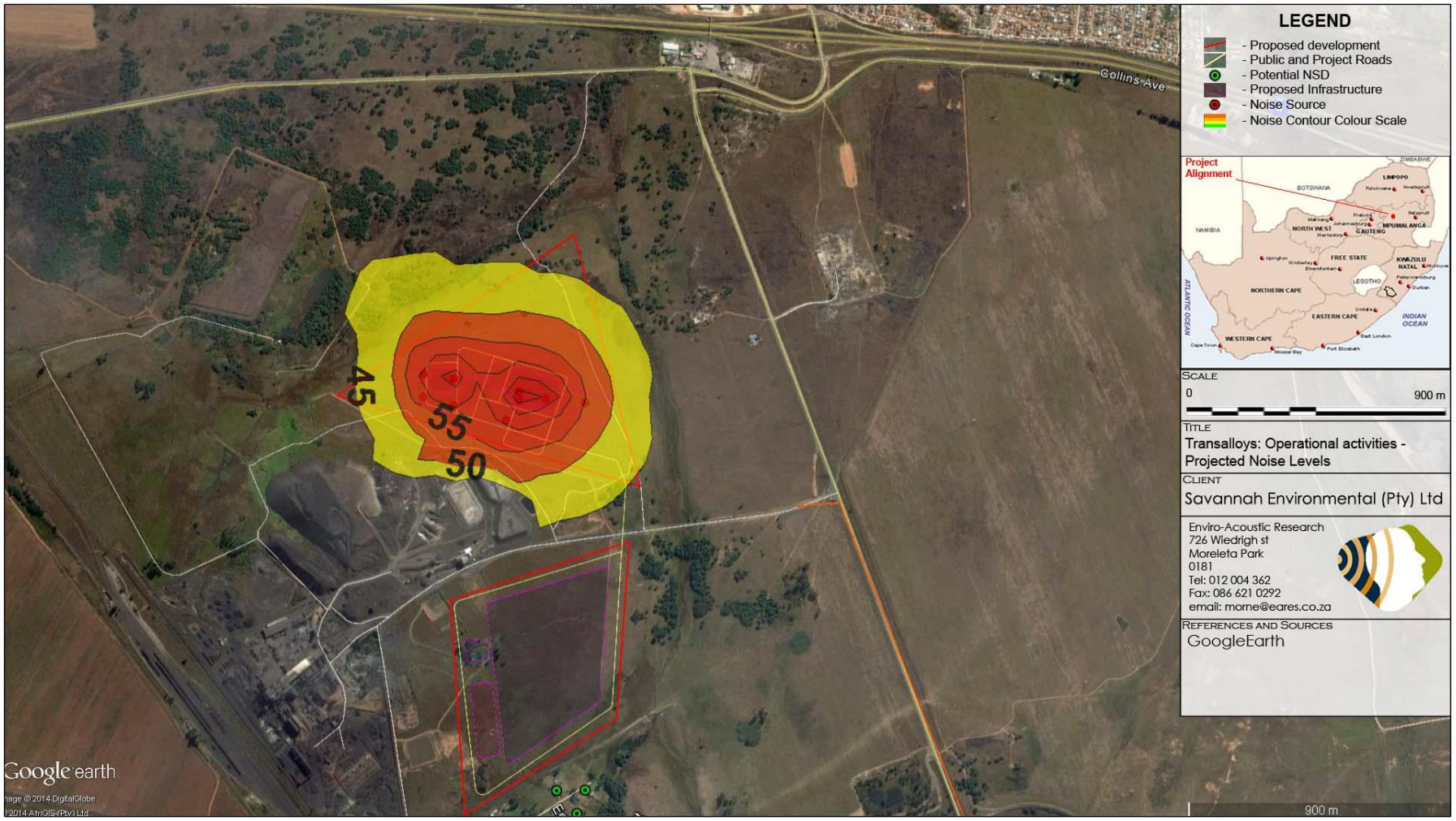



**Figure 7.10:** Night-time operational noise: Contours of constant rating levels

### *7.10.2 Summary of Impact Assessment*

Table 7.10 provides a summary of the assessment of potential noise impacts. More detail regarding the impacts and determination of significance is provided within the specialist report contained in **Appendix K**.

**Table 7.10:** Summary of Noise Impacts (all project components)

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Noise impacts associated with construction activities during the day | Low (negative) | Low (negative) | This impact is cumulative with existing ambient background noises as well as other noisy activities. |
| Noise impacts associated with construction activities during the night | Low (negative) | Low (negative) | This impact is cumulative with existing ambient background noises as well as other noisy activities. |
| Noise impacts associated with operation activities during the day (06:00 – 22:00) | Low (negative) | Low (negative) | This impact is cumulative with other ambient sounds. |
| Noise impacts associated with operation activities during the night (22:00 – 06:00) | Low (negative) | Low (negative) | This impact is cumulative with other ambient sounds. |

**Mitigation measures:**

» Construction activities close to Clewer would most likely be audible to these receptors, and if these construction activities take place at night, it may result in noise complaints. During quiet periods it may even change the ambient sound levels with more than 7 dB, which is defined as a disturbing noise by the National Noise Control Regulations. As such it is recommended that no construction activities take place within 250 m (preferably 500 m) from these receptors at night. Quarterly noise measurements are recommended at NSD01 during the construction phase as well at any other receptors that registered a valid and relevant noise complaint.
» No mitigation or routine noise monitoring during operations is recommended. Should any valid noise complaints be registered relating to the operation of the power station, noise measurements should be conducted as recommended by an acoustical consultant, and additional mitigation recommended if required.

### *7.10.3 Comparison of Alternatives*

**Site and layout alternatives:** Construction of the power station on the alternative sites closer to the identified noise receptors (i.e. site 2, 4 and

potentially 5) will likely result in exceedances of the 45 dBA rating level set by the World Health Organization. Site 1 (preferred site) for the operation of the power station is the preferred site from a noise perspective.

**Water Pipeline:** The construction of the water pipeline to Highveld Steel will not have a noise impact on any identified noise sensitive developments and from a noise perspective is preferred to the EWRP option which is aligned through Clewer, where identified noise sensitive receptors are situated.

**Technology / layout alternative:** The 55MW power plant is preferred from an noise impact perspective over the 150MW plant due to smaller footprint, thereby allowing the entire footprint of the power plant and ash disposal facility to be located on Site 1, which is situated further away Clewer, thereby mitigating noise impacts to a greater extent.

### *7.10.4 Implications for project implementation*

Construction activities close to the community (living just south of the proposed ash disposal facility) would most likely be audible to these receptors, and if these construction activities take place at night, it may result in noise complaints. During quiet periods it may change the ambient sound levels with more than 7 dB, which is defined as a disturbing noise by the National Noise Control Regulations. As such it is recommended that no construction activities take place within 250 m (preferably 500 m) from these receptors at night.

The assessment also indicated that there is low potential of a noise impact during the operational phase and no mitigation or routine noise monitoring is recommended. Should any valid noise complaints be registered relating to the operation of the power station it will be required to conduct noise measurements as recommended by an acoustical consultant, and implement additional mitigation if required.

### *7.10.5 Conclusions and Recommendations*

There exists a potential for noise impacts during construction, specifically in the vicinity of the one identified sensitive receptor located close to the site. This impact will be of short duration (i.e. restricted to the construction phase) and of lower probability if the area adjacent to Clewer is avoided due to the construction of the 55MW alternative. There is a low potential of a noise impact during the operational phase. No mitigation or routine noise monitoring is therefore required in the operation phase of the facility.

## 7.11 Potential Visual Impacts

### *7.11.1 Results of Impact Assessment*

A viewshed analysis for the proposed power station and ancillary infrastructure is shown in Figure 7.8. The viewshed analyses were undertaken from a number of vantage points within the proposed development area at offsets indicative of the dimensions of the structures, i.e.:.

- 250m[20] (smoke stack – approximate maximum height);
- 25m (the core power station); and
- 50m (ash disposal facility at approximate maximum height).

The viewshed map shows the varying areas of potential exposure in different colours. Some areas may for instance only have partial views of the power station (e.g. only the smoke stacks), while other areas may be entirely exposed, thereby effectively increasing the frequency of exposed structures. It is evident from the preliminary viewshed analyses that the considerably tall smoke stacks have the potential to be visually exposed within much of the study area. The stacks may be visible, from varying distances, from the outskirts of most of the built-up or populated areas within the study area. This is especially relevant for observers residing in the Clewer town or small holdings located within 2.5km of these sites. The smoke stacks would similarly be exposed to observers travelling along the roads within the study area, as well as from homesteads or farm residences located to the south. The latter will generally be from longer distances, due to the absence of farm residences in close proximity to the industrial and mining activities surrounding the proposed development sites.

The general power station plant (excluding the smoke stacks) and associated infrastructure is expected to have a much reduced and constrained core area of visual exposure. Immediate or short distance exposure is expected within a 2.5km to 5km radius from these sites. Most of the exposure will fall within vacant land, the Transalloys property or within other industrial or mining land. Sensitive visual receptors within this zone however includes observers travelling along the N4, R104 and R547 roads, as well as the residents of Clewer (town and small holdings) and residents located along the southern outskirts of Kwa-Guqa. Visual exposure of the power station from the west and north-west east is highly unlikely, due to the existing visual obstructions and visual clutter associated with the Highveld Steelworks.

[20] 250m stack height represents a worst-case scenario and the impact assessment has been undertaken on this basis. Recommended stack height is 150m based on the results of the air quality assessment.

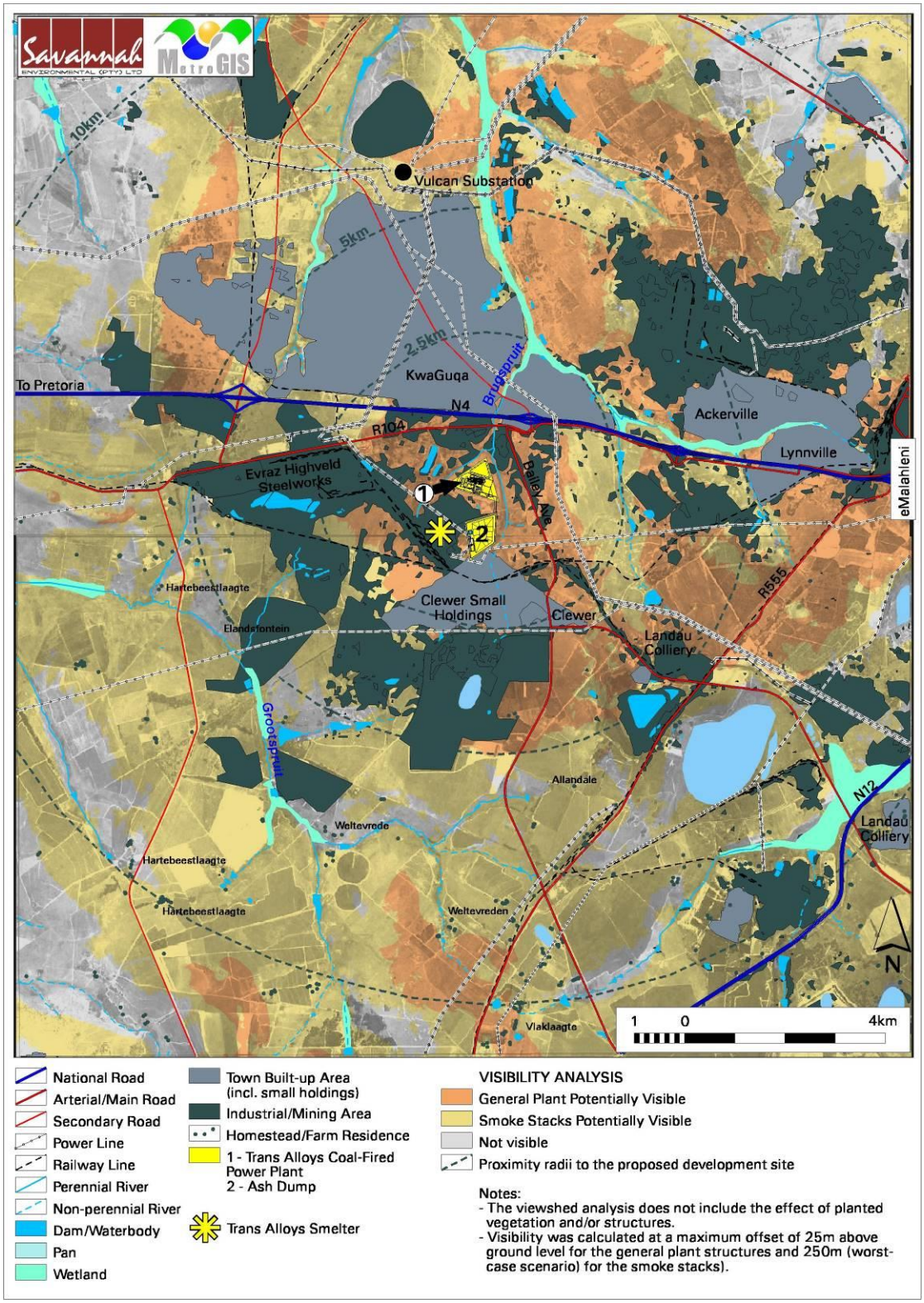



**Figure 7.8:** Potential visual exposure of the proposed Transalloys Power Plant structures.

The intensity of visual exposure is expected to subside beyond a 5km to 10km radius. Observers or sensitive visual receptors are highly unlikely to view the power station plant in isolation. An increased amount of visual clutter (urban,

mining and industrial structures and activities) is expected to make unobstructed views highly improbable.

Visibility beyond 10km from the proposed development is expected to be negligible and highly unlikely due to the distance between the object (development) and the observer. The smoke stacks may however still be visible although not likely to dominate the frame of view.

The general conclusion is that the structures may constitute a high visual prominence, potentially resulting in a visual impact, where visible from shorter distances (i.e. less than 2.5km or 5km).

The quantitative analyses of possible impact have been integrated as a visual impact index (refer to Figure 7.9). The sum of values assigned for each visual impact parameter is used to identify and visualise areas of high, moderate and low visual impact. Typically a location with close proximity to the proposed facility, a high viewer incidence, a predominantly negative perception and high visual exposure would have a high value on the index, thereby signifying a high visual impact.

The following is of relevance:

» The visual impact index map indicates a core zone of potentially high visual impact within a 2.5km radius from the facility, where the facility could potentially be viewed from land generally devoid of sensitive visual receptors (i.e. vacant land or industrial areas). A large portion of this area is located on Transalloys property or part of the Highveld Steel operations.

» Where sensitive visual receptors occur within the 2.5km radius from the facility and exposure is likely, the visual impact is anticipated to be very high due to the relative close proximity of the observer to the power station infrastructure, especially the smoke stacks. Sensitive visual receptors (both along roads and receptor sites), include:
  - Observers travelling along the N4 national road;
  - Observers travelling along the R104 arterial road;
  - Observers travelling along Baily Avenue;
  - Observers residing at the northern outskirts of the Clewer small holdings; and
  - Observers residing along the southern fringe of the KwaGuqa residential area.

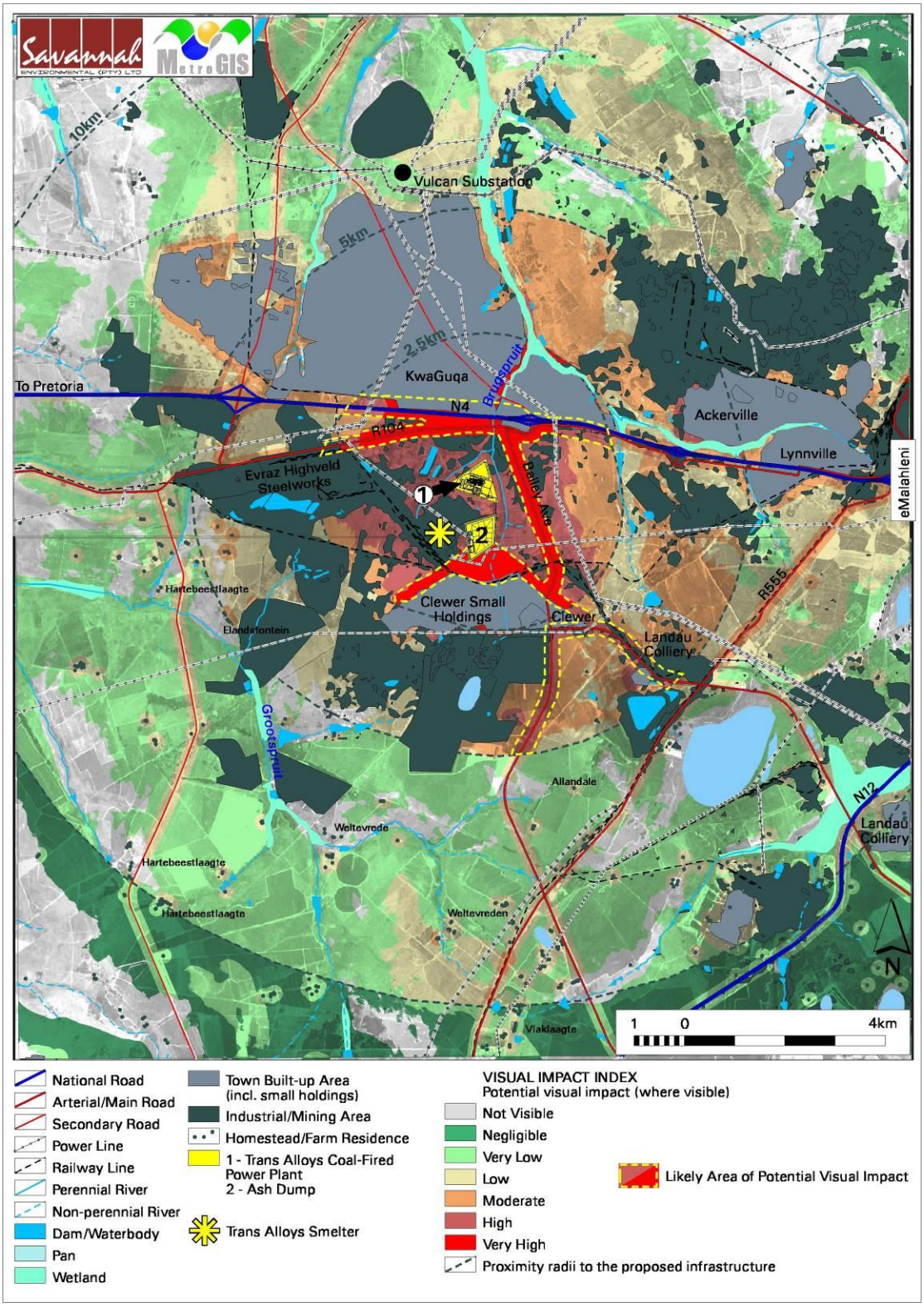



**Figure 7.9:** Visual impact index of the proposed power station and ancillary infrastructure.

Observations from the first three identified sensitive visual receptors (i.e. the roads) are generally expected to be by observers in transit. This implies a fleeting or brief view of the infrastructure, somewhat mitigating the potential

visual impact. The alignment of the N4 national road is further slightly depressed with high embankments on either side of the road, potentially obstructing views of the power plant. This section of the N4 east and west is further separated along the median by a brick wall intended to discourage pedestrians from crossing the highway, potentially shielding eastbound travellers from the core power station structures.

Residents of the northern section of the Clewer small holdings (4) will be located in close proximity to the ash disposal facility and ash dumping activities (for the 150MW layout alternative). Although the growth of the ash disposal facility will be a gradual process over the operational lifespan of the power plant, the visual impact is likely to be of high significance.

Residents of the Kwa-Guqa town, located north of the N4 national road, may have relatively short distance views of the coal stockpile and power plant. This is however only likely where the observers are elevated above the N4. Large sections of this area are located below the alignment of the N4, which acts as a visual barrier.

The potential visual exposure within the 2.5km to 5km zone from the power station infrastructure is expected to have a moderate visual impact, where sensitive visual receptors are generally absent, but may be high where observers are present. The southern section of Baily Avenue and a section of Apex Road fall within this category. Observers travelling north along these two roads may experience a high visual impact as they approach the facility. The visual impact beyond 5km and up to 10km from the power station, is expected to be low, but may potentially be moderate where observers are present. Visibility beyond 10km from the proposed development is expected to have a negligible or very low visual impact. Visibility beyond 10km from the proposed development is expected to have a negligible or very low visual impact.

### *7.11.2 Summary of Impact Assessment*

Table 7.11 provides a summary of the assessment of potential visual impacts. More detail regarding the impacts and determination of significance is provided within the specialist report contained in **Appendix L**.

**Table 7.11:** Summary of Visual Impacts

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Visual impact on users of major roads in close proximity to the proposed facility. | High (negative) | Moderate (negative) | The construction of the power station is expected to increase the cumulative visual impact within the region, considering the visual exposure of the industrial activities (Highveld Steel and Transalloys plants), power line and railway line infrastructure, and the mining activities. However, the close proximity of the proposed power station to these industrial or mining areas and infrastructure (existing visual disturbances) effectively consolidates industrial infrastructure within this node. |
| Potential visual impact on residents of KwaGuqa and Clewer in close proximity to the proposed power station and ash disposal facility. | High (negative) | Moderate (negative) | |
| Visual impact of the power station on sensitive visual receptors within the region | Low (negative) | Low (negative) | |
| Visual impact of construction on sensitive visual receptors. | High (negative) | Moderate (negative) | None |
| Lighting Impacts | High (negative) | Moderate (negative) | The development of the power station will contribute to an increase in light sources within the region, and as a result an increase in lighting impact at night. |

**Mitigation measures:**

» Retain the area indicated as "potential visual buffer area" (especially the Brugspruit and side stream wetlands/floodplains) in its current state (if possible) in order to create a natural offset between the observers and the development.
» Plant vegetation barriers (where required) along the southern boundary of the ash disposal facility site in order to shield the ash disposal facility, structures and activities from observers residing in the north of Clewer.
» Retain and maintain natural vegetation in all areas within the site and maintain the general appearance of the facility as a whole.
» Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).
» Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights.
» Make use of minimum lumen or wattage in fixtures.
» Make use of down-lighters, or shielded fixtures.
» Make use of Low Pressure Sodium lighting or other types of low impact lighting.

### *7.11.3 Comparison of Alternatives*

**Site and layout alternatives:** The proposed power station site (site 1) has the benefit of being located adjacent to the existing smelter complex and slag dumps. This location generally fulfills the requirements of the consolidation of visual impacts within an existing development node, thereby negating or mitigating potential secondary visual impacts (e.g. the construction of additional services and infrastructure).

**Water Pipeline:** The alignment between the proposed power plant and the Evraz Highveld Steelworks is preferred from a visual perspective as construction phase visual impacts will be limited along this route due to the absence of sensitive visual receptors. There is no preference from a visual perspective during operations as the water pipeline will be buried underground and will not be visible.

**Technology / layout alternative:** The visual profile of the 55MW layout alternative will be similar to the existing industrial situation in the area. The 55MW power plant is therefore preferred from a visual impact perspective over the 150MW plant due to smaller footprint, lower stack height and distance from the identified visual sensitive receptors.

### *7.11.4 Implications for project implementation*

The primary visual impact, namely the appearance of the power station and ancillary infrastructure is not possible to mitigate. Reduction of the stack height from 250m (as modelled) to 150m (as recommended in the air quality study for the 150MW layout alternative) will reduce the potential visual impact, although the area of visual exposure will be similar. Further reduction of the stack to 60m (for the 55MW layout alternative) will mitigate the visual impact significantly.

### *7.11.5 Conclusions and Recommendations*

The Highveld Steel, Transalloys Smelter Complex and the Landau colliery mining activities are the dominant industries in the area. The locality of these industrial activities in relatively close proximity to residential areas raises concerns that may exasperate the perceived visual impact of the proposed power plant.

It is generally acceptable, from a visual impact point of view, to place industrial infrastructure within existing industrial areas. The existing visual disturbances associated with the Transalloys Smelter and the Highveld Steel works, and the close proximity of the proposed power plant to the smelter complex, somewhat mitigates the visual impact of the structures and activities. This will also contribute to the potential cumulative visual impact of industrial infrastructure within the region. It is however still preferable to consolidate the proposed

infrastructure in areas of existing visual disturbance, rather than to spread it over larger areas.

The overall finding of the visual impact assessment is that if mitigation is undertaken as recommended, it is concluded that the significance of anticipated visual impacts will generally remain at acceptable levels. Specific attention should be given to the suggested visual buffer area along the *Brugspruit* and associated wetlands surrounding the proposed development site. No encroachment on, or disturbance of these natural areas should be permitted, either during the construction or operational phases of the power plant.

Other potential mitigation measures for the proposed power plant include the maintenance and general appearance of the facility. These measures focus on the fact that when the facility is seen by outsiders; the general impression should be favourable. Timely maintenance of the station, ancillary infrastructure and the general surrounds of the property (gardens, access roads, etc.) can prevent the visual impact of degradation and perceived poor management. The most notable aspect of maintenance on this type of structure is the painting of the cladding of the power station. In this regard and as a further mitigation to the visual impact, overtly contrasting and bright colours should be avoided.

## 7.12 Potential Impacts on Heritage Sites

### *7.12.1 Results of Impact Assessment*

The heritage survey identified the following features in the study area:

» A cemetery containing approximately 100 graves was recorded in close proximity to the proposed power plant site adjacent to the Transalloys access road. The graves are all aligned east-west with various types of grave dressing and headstones consisting of concrete borders with headstones, stone packed with or without headstones, granite borders, soil heaps and headstones and heaps of brick. A number of the graves are fenced in with several child graves marked by small mounds of soil.
» The demolished remains of structures are also found scattered over the study area, but nothing is left of these structures apart from cement slabs. These sites are of no significance as nothing is left of the structures to mitigate or interpret and no further action is necessary for these sites.
» A single standing modern face brick, utility building is located in the study area.
» According to personnel from Transalloys, two initiation sites occur in the study area, although they are located outside of the development impact area.

### *7.12.2 Summary of Impact Assessment*

Table 7.12 provides a summary of the assessment of potential impacts on heritage sites. More detail regarding the impacts and determination of significance is provided within the specialist report contained in **Appendix M**.

**Table 7.12:** Summary of impacts on Heritage Sites (all project components)

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Impacts of the power station on heritage sites of low significance (concrete slabs) | Low (negative) | Low (negative) | None. |
| Impact of the power station on the cemetery. | Low (negative) | Low (negative) | If the mitigation recommendation is followed and the site is preserved no cumulative impact is foreseen on graves in the area. |
| Impact of the power station on the initiation sites | Low (negative) | Low (negative) | None as no direct impact is foreseen on the sites. |

**Mitigation:**

» The cemetery site is located outside of the development footprint of any of the alternatives and no direct impact is foreseen on the site. However to protect the site from accidental damage it should be fenced off during construction with an access gate provided for family members.

» The location of initiation sites should be noted by the planning team should any future expansions into the area occur. Ideally these practices should be allowed to continue. These areas should also be avoided by Transalloys and power station employees during initiation school times.

### *7.12.3 Comparison of Alternatives*

**Site and layout alternatives:** None of the site alternatives considered are preferred from a heritage perspective as no heritage sites or features were identified which will be directly impacted by the proposed power station and associated infrastructure.

**Water Pipeline:** The alignment between the proposed power plant and the Evraz Highveld Steelworks is preferred from a heritage perspective purely because of the reduced potential for surface disturbances to occur (as a result of the shorter distance) as compared to the EWRP option and due to the proximity of the EWRP option to the built environment (i.e. through Clewer). No heritage features were identified along either of the water pipeline alignments.

**Technology / layout alternative:** There is no difference in potential heritage impacts between the 150MW project and the 55MW alternative due to the relative absence of heritage sites in the study area, suffice that less land will be required for the 55MW layout alternative reducing the potential for chance finds.

### *7.12.4 Implications for project implementation*

» Although the cemetery is located outside of the proposed impact area an influx of people and construction vehicles are expected to the site during construction. It is therefore recommended that the site is fenced with an access gate for family members.
» Both initiation sites are located outside of the proposed site alternatives and no direct impact is foreseen on the sites. The location of these sites should however be noted by the planning team in any future expansions in the area. These areas should also be avoided by Transalloys and power station employees during initiation school times. This should be easily achievable as there is a high level of security for the power station and employee's movements will be restricted within the fenced in areas.
» If any possible finds such as tool scatters, bone or fossil remains are exposed or noticed during construction, the operations must be stopped and a qualified archaeologist must be contacted to assess the find.

### *7.12.5 Conclusions and Recommendations*

No fatal flaws were identified in the heritage impact assessment study for the power station site. From an archaeological point of view there is no reason why the development should not proceed.

## 7.13 Potential Traffic Impacts

### *7.13.1 Results of Impact Assessment*

The power station transport requirements have been estimated as follows:

***Construction Phase:***

» Transport of Material: Heavy vehicle trips are expected to be generated to transport construction material to and from the proposed power station site. The total number of truck trips during construction (34 months) was calculated as 11,390 (or 15.5 truck trips per day).
» Commuter trips (private and public transport): Commuter trips are expected to be generated daily by the skilled construction workers with approximately 90% using private transport. It is assumed that the semi- and unskilled works will be accommodated with approximately 90% using public transport.

The total number of arriving bus and car trips during construction (34 months) was calculated as 23 arriving bus trips per work day and 40 arriving car trips per work day.

***Operational Phase***

» Transport of Material: The power plant is estimated to receive 79 coal trucks and 13 limestone trucks per day based on 32 ton capacity trucks and unit at 100% capacity. It was assumed that coal and limestone trucks will originate from Middelburg.
» Commuter trips (private and public transport): Commuters trips are expected to be generated daily from the origins surrounding the power station. The commuter trips will be split into private and company dedicated bus transport trips. Staff are expected to be recruited and bussed from the surrounding towns of Witbank / eMalahleni, Thushanang, Hlalanikahle, Empumelelwni, Ackerville and Clewer. Skilled skilled personnel would originate from further afield Witbank / eMalahleni or Gauteng.
» Transport of Goods (deliveries): Trips are expected to be generated as a result of service delivery as well as transportation of goods / products to / from the power station.

***Decommissioning Phase***

Traffic volumes during decommissioning of the power station will be considerably lower than the operational phase and therefore it is expected that the traffic impact will be negligible.

The findings of traffic impact assessment are summarised as follows:

» At present vehicle trips to and from the existing Transalloys operation located at the site is using the existing private access road to obtain access to and from the R547 / Bailey Avenue.
» All of the intersections currently require upgrades irrespective of traffic generated by the proposed development.
» Five (5) intersections were identified in the study area as requiring improvements as indicated in Figure 7.10. The recommended improvements to Interchange 1 and 2 (R104/N4) are the responsibility of SANRAL, while Intersections 3, 4 and 5 are the responsibility of the Mpumalanga Department of Public Works Roads and Transport. Medium term future Improvements include:
    - Intersection 1: Signalise and widen existing stop controlled intersections
    - Intersection 2: Widen existing signalised intersection
    - Intersection 3: Convert existing four way stop intersection to roundabout
    - Intersection 4 and 5: Formalise lane markings

» The impact on the R104/N4 interchange could be avoided if the regional traffic is redirected to the regional and provincial roads, instead of using the national road for regional trip purposes. The upgrade and extension of the R104 could assist in this regard.
» In the long term future is has been shown that further improvements to the road network will be required irrespective of the proposed development's traffic.


**Figure 7.10:** Traffic study area and intersections

### *7.13.2 Summary of Impact Assessment*

The purpose of the proposed traffic improvements recommended by the Traffic Impact Assessment (**Appendix N**) is to ensure adequate vehicle capacity as well as safe vehicle movements during the construction and operational phase of the proposed development. Should the improvements not be made, cost could be incurred as a result of increased travel time and a potentially unsafe traffic environment.

**Table 7.13:** Assessment of the impacts associated with construction vehicles

| Potential impact | Significance without mitigation | Significance with mitigation | Cumulative impacts |
|---|---|---|---|
| Potential congestion, safety risks and damage to road surfaces associated with movement of construction related traffic to and from the site | Medium (negative) | Low (negative) | Damage to roads will affect other road users in the area and result in higher maintenance costs for vehicles of other road users. The costs will be borne by road users who were not responsible for the damage. Additional traffic will also increase the safety risks for other road users. |
| Potential congestion, safety risks and damage to road surfaces associated with movement of operational related traffic to and from the site | Low (negative) | Low (negative) | Damage to roads will affect other road users in the area and result in higher maintenance costs for vehicles of other road users. The costs will be borne by road users who were not responsible for the damage. |

**Mitigation measures:**
In addition to the required intersection up-grades listed in the TIA the potential impacts associated with heavy vehicles on other road users can be further mitigated by implementing the following mitigation measures:

» The movement of heavy vehicles to and from the site should be confined to period between 08h00 and 17h00 on weekdays. This would reduce the potential impact of heavy vehicles on AM and PM peak traffic travelling along R547/Bailey Avenue.
» Dust suppression measures must be implemented on gravel roads such as wetting of road surfaces on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. In this regard, the dust suppression measures related to vehicles listed in the Air Quality Assessment should be implemented (Airshed, November 2014);
» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

### *7.13.3 Comparison of Alternatives*

**Site and layout alternatives:** None of the site alternatives considered are preferred from a traffic perspective due to the regional nature of the study.

**Water Pipeline:** The alignment between the proposed power plant and the Evraz Highveld Steelworks is preferred from a traffic perspective as the route will not impact on existing road reserves during construction (causing disruption) as could be associated with the EWRP option situated primarily within existing road reserves.

**Technology / layout alternative:** The 55MW layout alternative will have a significantly reduced footprint, lower construction period and lower resource/material requirements during both the construction and operational phases. For this reason the 55MW layout alternative is preferred over the 150MW alternative as the potential traffic impacts will be lower.

### *7.13.4 Implications for project implementation*

» Five road improvement measures are recommended at the five identified intersections irrespective of whether the proposed development goes ahead or not.
» These mitigation measures should ideally be in place before the commencement of the construction and operational phase of the power station, but it is incumbent on SANRAL and the Mpumalanga Department of Public Works Roads and Transport to implement them.
» The applicant should engage with the road authorities to further address the issue of the recommended road upgrades and expected responsibilities in terms thereof.

### *7.13.5 Conclusions and Recommendations*

The traffic volumes generated by the proposed Transalloys Power Station development will not have a significant impact on the external road network as the road network requires various improvements irrespective of the development. Various intersection improvements are recommended in order to ensure safe adequate vehicle capacity as well as safe vehicle movements during the construction and operational phase. The applicant should engage with the road authorities to further address the issue of road upgrades.

## 7.14 Potential Socio-Economic Impacts

### *7.14.1 Results of Impact Assessment*

The proposed Transalloys Power Station will have both positive and negative social and economic impacts during the life cycle of the power station. Most of the positive impacts will be realised not only in the local economy, but to the rest of the country due to the multiplier effects. The negative socio-economic impacts expected to take place will largely be concentrated in the area directly surrounding the site and local community.

The key social issues associated with the construction phase are the following:

**Potential positive impacts**

» Creation of employment and business opportunities, and opportunity for skills development and on-site training;

**Potential negative impacts**

» Impacts associated with the presence of construction workers on local communities;
» Impacts related to the potential influx of job-seekers;
» Impacts, such as noise, dust and safety, associated with the movement of construction related traffic;
» Impacts, such as noise, dust and safety, associated with construction related activities;

**Employment and wages:** Based on the information provided by Transalloys the construction phase for the 150 MW alternative is expected to extend over a period of 34 months and create approximately 1 500 employment opportunities during peak construction. The project engineers estimate that ~50 % (750) of the employment opportunities will be for high skilled workers, 30% (450) for semi-skilled and 20% (300) for low skilled workers. Each construction artisan trade group will follow a bell shaped manpower curve during the course of the project. These curves all peak at different times during the project, so it is not possible to provide an accurate monthly wage breakdown per craft skill category. However, in broad terms, it is estimated over the 34 month construction schedule approximately US$ 63 million, US$ 34 million and US$ 24 million will be paid to the various contractors in construction payroll for high-skilled, semi-skilled, and low-skilled craft labour, respectively. The total wage bill for the project is therefore estimated to be in the region of US$ 121 million (~ R 1.3 billion, exchange rate of 1US$: R 11.00).

Given the well-developed energy and mining sector in the area, members from the local community in the area are likely to be in a position to qualify for the majority of the skilled, semi-skilled and low skilled employment opportunities associated with the project. The majority of the semi-skilled and low-skilled employment opportunities are likely to accrue to Historically Disadvantaged (HD) members from the local ELM community. As the levels of unemployment in the ELM are relatively high, the creation of potential employment opportunities, even temporary employment, will represent a significant, if localised, social benefit. However, in the absence of specific commitments from the developer to maximise local employment targets the potential opportunities for local employment will be reduced. The majority of the skilled employment opportunities are likely to be associated with the contactors appointed to construct the proposed coal-fired power station and associated infrastructure.

A percentage of the wage bill will be spent in the local economy and will create opportunities for local businesses in the ELM. The local service sector will also benefit from the proposed development. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The benefits to the local economy will however be confined to the construction period (34 months). The hospitality industry in the area is also likely to benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.

**Training and skills development:** In terms of training and skills development, the medium term duration of the construction phase will create opportunities to implement an effective training and skills development programme. The proponent should discuss this issue with representatives from the Department of Labour and the ELM.

**Capital expenditure:** The capital expenditure associated with the construction of the 150MW alternative is estimated in the US$ 345 million (~R 3.8 billion, exchange rate of 1US$: R 11.00). Material procurement is estimated to account for approximately 40% of the total EPC cost. Of this amount, it is estimated that approximately 40% (US$ 138 million) will be local or "in country" purchases and 60% (US$ 207 million) will be imported. The US$ 138 million (~R 1.5 billion) associated with local spend project will therefore create significant opportunities for local businesses and suppliers. A percentage of the capital expenditure associated with the construction phase will benefit local companies. In this regard given the dominant role played by the energy and mining sector there are likely to be a number of suitably qualified and experienced local engineering companies and contractors in the ELM.

**Local support:** In terms of local support the IDP and LED Manager for the ELM, Ms Nowamba and Mr Khadi respectively, and Ms Mavis Thebane, the Ward 9 councillor, all expressed strong support for the proposed project. They also stressed the importance of creating employment and training opportunities for members from the local community.

### *7.14.2 Summary of Impact Assessment*

Table 7.14 provides a summary of the assessment of potential social and economic impacts during the construction and operational phases. More detail

regarding the impacts and determination of significance is provided within the specialist report contained in **Appendix O**.

**Table 7.14:** Summary of Socio-Economic Impacts during the construction and operational phase

| Potential impact | Significance without mitigation | Significance with enhancement or mitigation | Cumulative impacts |
|---|---|---|---|
| **Construction phase** | | | |
| Creation of employment and business opportunities during the construction phase | Medium (positive) | High (positive) | Opportunity to up-grade and improve skills levels in the area. |
| Potential impacts on family structures and social networks associated with the presence of construction workers | Low (negative) | Low (negative) | Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community. |
| Potential impacts on family structures, social networks and community services associated with the influx of job seekers | Low (negative) | Low (negative) | Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community. |
| Potential dust and noise impacts associated with construction related activities | Medium (negative) | Low (negative) | Increase in ambient dust and noise levels during the construction period. Night time noise levels are of higher significance. |
| **Operational phase** | | | |
| Creation of employment and business opportunities associated with the operational phase | Medium (positive) | Medium (positive) | Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area. |
| Creation of market for stockpiled lower grade coal and reduction of impacts | Medium (positive) | High (positive) | Reduction in dust impacts associated with existing coal stockpiles and delayed use of new |

| Potential impact | Significance without mitigation | Significance with enhancement or mitigation | Cumulative impacts |
|---|---|---|---|
| associated with coal stockpiles (dust, sterilised land and carbon footprint) | | | coal resources. |
| Development of additional energy generation capacity | Medium (positive) | Medium (positive) | Improved energy supply capacity by reducing future demand on Eskom. |
| Potential impact of emissions associated with the operational phase of the coal-fired power station on human health | Medium (negative) | Low (negative) | Contribution to already elevated air pollution levels in the HPA and surrounding areas resulting in deteriorating air quality conditions and associated impacts on human health |
| Visual impact associated with the proposed coal-fired power plant and the potential impact on the areas rural sense of place. | Low (negative) | Low (negative) | Potential impact on current rural sense of place |

**Mitigation:**

Key mitigation measures to manage social and economic impacts during the operation of the power station are as follows:

» The operator of the power station should be encouraged to procure materials, goods and services required for the operation of the facility from local suppliers to increase the positive impact in the local economy as far as possible.
» Where possible, the local labour should be considered for employment to increase the positive impact on the local economy. Local small and medium enterprises should be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible.
» Where possible train and empower local communities for employment in the operations of the power plant.
» The mitigation measures proposed by the visual, noise and air pollution specialists should be adhered to.
» The results of the monitoring programmes should be made available to local communities.
» Night-time lighting should be limited to a minimum but should not jeopardise the safety and security at the facility.

### *7.14.3 Comparison of Alternatives*

**Site and layout alternatives:** The selection of the proposed sites for the development of the infrastructure took into consideration the potential noise, air quality and visual impact of the power station and the siting of the power station and ash disposal facility has been optimized on this basis. The modelling of the air quality and noise impacts which will result in the most tangible social impacts favour the current siting arrangement.

**Water Pipeline:** The alignment between the proposed power plant and the Evraz Highveld Steelworks is preferred from a social perspective as the route will not impact on existing road users (resulting in disruption within Clewer) which would be associated with the EWRP option situated primarily within existing road reserves and running through Clewer.

**Technology / layout alternative:** The preferred plant technology has been considered in terms of the noise, air quality and visual impact in the relevant sections. In this regard the 55MW alternative is preferred over the 150MW alternative. Due to the improved positive economic impacts offered in the development of the 150MW alternative, this alternative is preferred.

### *7.14.4 Implications for project implementation*

Key mitigation measures to manage social and economic impacts during the construction phase are as follows:

» During the design and construction phase the developer should meet with local communities (Clewer) to determine their concerns and take into consideration any mitigating proposals.
» Increase the local procurement practices and employment of people from local communities as far as feasible to maximize the benefits to the local economies.
» Sub-contract to local construction companies where possible. Use local suppliers where feasible and arrange with the local small and medium enterprises to provide transport, catering, and other services to the construction crew.
» The developer should engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods, and products from local suppliers where feasible.
» Set up apprenticeship programmes to build onto existing or develop new skills of construction workers, especially those coming from the local communities.
» Vehicles should adhere to speed limits to reduce dust and noise disturbances.

### *7.14.5 Conclusions and Recommendations*

The findings of the SIA indicate that the development of the proposed Transalloys 150MW power plant will create employment and business opportunities for locals during both the construction and operational phase of the project. The significance of this impact is rated as High Positive. By establishing their own energy generation capacity Transalloys are not only addressing their own needs, but are also reducing the future energy demand on Eskom, which, in turn creates benefits for other energy users in South Africa due to additional supply within the electricity network.

However, the impact on the ambient air quality in the Highveld Priority Area and traffic improvements will need to be addressed as recommended in the relevant specialist studies. In this regard the recommendations contained in the Air Quality Assessment should be implemented and the roads authorities engaged to establish the expectations around such traffic improvements.

## 7.15 Assessment of the Do Nothing Alternative

The 'Do-Nothing' alternative is the option of not constructing the proposed Transalloys power station. Should this alternative be selected, there would be no environmental impacts on the site as the facility would not be constructed. The following impacts are however anticipated with the implementation of this option:

**Land use:** The current land-use is restricted by surrounding industry and mining expansion plans. Should the current land use activities continue, informal grazing (low rent) on the site will continue. The potential to utilise the site sustainably and in an optimal way will therefore not be realised.

**Ecological processes:** The majority of the site plays little role in the maintenance of ecological processes. The no-go alternative will therefore not play a role in maintaining any noteworthy ecological systems.

**Socio-economic impact:** The no-go alternative will result in the economic benefits discussed in section 7.14.1 not being realised and a subsequent loss of income and opportunities to local people, as well as additional capacity of the electricity grid. From this perspective the no-go alternative is not preferred.

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of energy would not be realised with the implementation of the no go option. Although the facility is only proposed to contribute 150MW for use by Transalloys, this would result in the energy from the electricity grid currently utilised by Transalloys being freed up for other electricity users. The generation of this electricity offers a range of potential socio-economic and environmental benefits at a regional and national scale.

In conclusion, the implementation of the no-go option would not contribute to the required electricity needs of the country and would not assist in job creation at a local and regional scale. This option is therefore not preferred.

# ASSESSMENT OF CUMULATIVE IMPACTS CHAPTER 8

Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R543) as meaning "the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area".

There is therefore a legislated requirement to assess cumulative impacts associated with a proposed development. This chapter considers whether the potential impacts associated with the proposed project become more significant when considered in combination with the other known or proposed power station and/or coal-mining related projects within the area which may have cumulative environmental impacts and implications.

## 8.1. Approach Taken to Assess Cumulative Impacts

In the sections below the potential cumulative impacts of other industrial-type developments within the region are explored (proposed and operational). The discussion and associated conclusions must be understood in the context of the uncertainty associated with the proposed development and the qualitative nature of the assessment.

## 8.2. Projects within the Study Area

In order to exploit the Witbank coal reserves, a number of collieries have been established within the Witbank and Middelburg region. In addition, a number of coal-fired power generation facilities are located or proposed to be located within this region. Many industrial role-players are also strategically located within this area.

The proposed Transalloys power station site is situated near to the following industrial / mining facilities in terms of which the potential cumulative impacts must be assessed:

- The existing Transalloys siliconmanganese smelter complex (adjacent)
- Evraz Highveld Steel and Vanadium which is a producer of steel and vanadium products (within 2km).
- The proposed Anglo Coal Landau Colliery Life Extension Project (new pits within 1km west of Transalloys)
- The proposed Izazi Colliery on Portions 26, 36, 37 and a portion of portion 46 of the farm Elandsfontein 309 JS (within 1km east of Transalloys).

- A proposed colliery on Portion 25 of the farm Elandsfontein 309 JS (within 1km east of Transalloys).
- The existing AngloAmerican Landau Colliery (within 5km to the south-east)
- The proposed Khanyisa Coal Fired Power Station (450MW) within the South African Coal Estates Complex (including the Greenside, Kleinkopje and Landau Collieries).
- Existing power stations including the soon to be operational Eskom Kusile Power Station situated less than 20km to the west and the Eskom Duvha Power Station within 22km to the south-east.

## 8.3. Assessment of Potential Cumulative Impacts

Significant cumulative impacts that could occur due to the development of the power station and its associated infrastructure in proximity to other industrial/mining type developments include impacts such as:

- Impacts on biodiversity
- Impacts on soils and agricultural potential
- Impacts on surface water resources
- Impacts on groundwater resources
- Impacts on air quality and human health
- Impacts on heritage sites
- Visual impacts
- Socio-economic impacts

### *8.3.1. Potential Cumulative Impacts on Biodiversity*

The immediate area as well as the larger region is characterised by moderate to high levels of habitat loss and fragmentation. Impacts of a cumulative nature on biodiversity, although estimated to be of moderate and low significance, represent a continuous, low level threat to biodiversity on a local and regional scale. The increase in industrial and mining activity in the region implies constant losses of natural habitat and species. This is exacerbated by the decline in environmental quality caused by peripheral and indirect impacts such as species invasion, degradation, contamination, disruption of ecological processes, habitat fragmentation and isolation, etc.

The region in which the study area is located is currently characterised by existing industrial activities (most notably Highveld Steel and Transalloys) buffered by large open natural areas. Planning for the development of new collieries or for the extension of existing collieries is however underway and it is anticipated that these natural buffers may soon be lost as the area becomes increasingly characterised by mining and industrial activities / projects.

Cumulative impacts of habitat destruction and the associated loss of species are regarded severe on a local and regional scale. Uninterrupted habitat is a precious commodity for biological attributes in modern times, particularly in areas that are characterised by moderate and high levels of transformation. The loss of natural habitat, even small fragments, implies that endemic biodiversity has permanently lost the opportunity to occupy that space, effectively placing a higher premium on available food, water and habitat resources in the immediate surrounds or remaining portions of natural habitat. This, in some instances, might imply that the viable population of plants and animals in a region will decrease proportionally with the loss of habitat, eventually decreasing beyond a viable population size. The danger in this type of cumulative impact is that effects are not known or are not visible with immediate effect and normally when these effects become visible, they are usually beyond repair. Impacts on linear areas of natural habitat affect the migratory success of animals in particular. Cumulative impacts on biodiversity are therefore expected to be of **medium significance**.

### *8.3.2. Potential Cumulative Impacts on Soils and Agricultural Potential*

There are extensive agricultural areas in the area where commercial farming is undertaken. Cumulative impacts relate to the permanent loss of agricultural land otherwise available for crop production. The impact on agriculture due to the proposed Transalloys power plant is limited due to the consolidation with existing industrial impacts on soils of low potential. However, due to the mining rights applications over existing nearby agricultural land cumulative impacts are anticipated and crop production in the wider study area is likely to be impacted. Notwithstanding, the development of multiple mining developments within the region is not expected to affect food security in the region as the area has long since been allocated towards mining/industrial type developments under existing surface rights and as identified in terms of regional spatial development plans. Overall agricultural impacts are considered to be of **low significance**.

### *8.3.3. Potential Cumulative Impacts on Surface Water Resources*

The upper reaches of the Olifants River Catchment are characterised mainly by mining, agricultural and conservation activities. Potential impacts on surface water relate to impacts on water quantity and quality in the region from these activities. During 2001 a social assessment of the Olifants River was conducted to ascertain the dependence of communities and stakeholders on a healthy riverine ecosystem (Singh and van Veelen, 2001). Social use of the river was found to be incidental in the Upper Olifants catchment, but should be taken into consideration during drought periods, when boreholes are likely to dry up and people and livestock may become reliant on the river.

The overall water resources situation for the Upper Olifants WMA is indicated in Table 8.1. Evident is the bulk of the water allocation for power generation purposes. The surrounding coal mines and industries also produce a surplus of water in the area from mine dewatering.

**Table 8.1:** Summary of the water availability/use, requirements and balance for the Upper Olifants WMA (Pollard and Du Toit, 2011)

| **Availability** | **Upper Olifants WMA (million $m^3/a$)** |
|---|---|
| Total local yield | 238 |
| Transfers in | 171 |
| **Grand Total Water Availability** | **409** |
| **Use** | |
| Irrigation | 44 |
| Urban | 62 |
| Rural | 6 |
| Mining and industrial | 20 |
| Power generation | 181 |
| Afforestation | 1 |
| **Total Requirements** | **314** |
| Transfers out | 96 |
| **Grand Total** | **410** |
| **Balance** | **-1** |

Impacts on surface water quality (including that within wetland systems) relate to possible sedimentation and contamination from activities associated with the proposed developments. The risks of this occurring increase with the increased number of developments. The Brugspruit together with its unnamed western tributary forms a tributary of the Klipspruit which ultimately feeds into the Olifants River. Increasing pressures on these systems will be registered if pro-active management and mitigation measures are not taken by the respective role-players. Due to the intensity of proposed mining activity around the proposed power plant, cumulative impacts are expected to be of **medium significance**.

### *8.3.4. Potential Cumulative Impacts on Groundwater Resources*

Potential impacts on groundwater relate to impacts on water quantity and quality in the region. Groundwater quantity is potentially affected by opencast mining activities in the region. The surrounding coal mines and industries also produce a surplus of water in the area. The establishment of the proposed power station will not affect groundwater quantity as no abstraction from groundwater resources is proposed. Therefore, the proposed project will not contribute to this impact.

Impacts on groundwater quality relate to possible contamination from activities associated with the proposed developments, specifically in terms of stockpiling of coal and waste management activities. The risks of this occurring increase with the increased number of developments. Specific areas of risk associated with the proposed project relate to the ash disposal facility and coal stockpile at the power station, as well as the wastewater treatment works. Should these activities result in impacts on groundwater resources, cumulative impacts with the nearby mining activities may occur. Although these potential impacts could not be quantified (due to no assessment data being available from other developments in the area at the time of finalisation of this report), these impacts are reduced in their significance as groundwater is not widely utilised for potable use and domestic purposes in the area. In the instance of the proposed power station, the implementation and management of an appropriate liner system at both the ash disposal facility and coal stockpile area will minimise the potential for impacts in this regard, thereby reducing the risks of cumulative impacts in the region.

### *8.3.5. Potential Cumulative Impacts on Air Quality and Human Health*

The proposed Transalloys Power Project is located in the Mpumalanga Highveld and is therefore situated within the boundaries of the Highveld Priority Area (HPA), which is an area that has been identified as characterized with poor air quality. Power generation activity in the HPA is the major source of $SO_2$ emissions (82%) and NOx emissions (73%) while it is only responsible for a relatively small contribution to the total PM10 load (12%) (DEA, 2011b). The largest contributors to all three pollutants are power generation, residential fuel burning and motor vehicles.

Isopleth plots reflect the incremental GLCs for $PM_{2.5}$, $PM_{10}$, $NO_2$ and $SO_2$. The release of $PM_{2.5}$, $PM_{10}$ and $NO_2$ during the operational phase is expected to result in exceedances of both long term (annual) and short term (1-hour and/or 24-hour) ambient air quality criteria off-site. When unmitigated, a significance weighting of *'medium'* is assigned to potential inhalation health impacts associated with $PM_{2.5}$, $PM_{10}$ and $NO_2$. Due to the unavailability of ambient baseline concentrations, the total cumulative pollutants concentrations were not distinctly assessed, however cumulative impacts as a result of additional mining/industrial activities in the area are considered.

» The proposed operational activities will contribute to the $PM_{2.5}$ baseline footprint. Qualitative assessment indicates that the pre- and post-mitigation increase in impact is expected to be medium.
» The proposed activities will contribute to baseline $PM_{10}$ levels in the area. Impacts within the existing and proposed Transalloys premises are expected

to significantly increase and exceed the 2015 NAAQS limit. $PM_{10}$ impacts in Clewer and surroundings will also increase, but the pre- and post-mitigation increase in impact is weighted medium.

» The proposed activities will contribute to the $NO_2$ footprint in the area. By qualitative assessment, the impact is expected to be medium.
» The proposed activities will contribute to the $SO_2$ footprint in the area. By qualitative assessment, the impact is expected to be medium.
» Dustfall impacts within the existing and proposed Transalloys premises are expected to significantly increase and exceed the NDCR non-residential limit. Dustfall impacts in Clewer and the immediate area will also increase, but the pre-mitigation impact is expected to be medium, while the post-mitigation increase in impact is expected to be low.

Cumulative impacts are expected to be most significant on the town of Clewer which is situated adjacent to the Transalloys smelter, and south west and south-east of the proposed power station and coal mining activities. It is important that an emission control and reduction strategy for dust is designed and implemented for the power station, ensuring that the contribution to ambient concentrations is minimised.

### *8.3.6. Potential Cumulative Impacts on Heritage Sites*

Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive. However, no heritage sites will be impacted by the proposed Transalloys power station activities and no cumulative impacts are anticipated. Furthermore, few Early, Middle and Late Stone Age are documented in the area while Iron Age sites that have been identified to the west of Bronkhorstspruit and in the vicinity of Bethal.

The risk of significant cumulative impact in the region is therefore considered to be low. It still remains important to observe mitigation measures and to avoid identified sensitive heritage features as far as possible so as to minimise this risk further. Each proposed mining or industrial activity in the area is required to identify sites of heritage significance prior to development.

### *8.3.7. Potential Cumulative Visual impacts*

Prominent rivers or streams in the area include the Grootspruit, to the south-west, and the Brugspruit traversing east of the Transalloys plant. This water course (wetland) and grassland account for the remaining scenic natural resources in an area largely dominated by industrial and surface mining activities. This area is considered sensitive from a visual resource perspective and may be

considered as a visual buffer zone between the smelter complex, power plant and ancillary infrastructure and the N4, R104, R547 (Bailey Avenue) and Clewer.

The construction of the power station is expected to increase the cumulative visual impact within the region, considering the visual exposure of the industrial activities (Highveld Steel and Transalloys plants), power line and railway line infrastructure, and the mining activities.

However, the close proximity of the proposed power station to these industrial or mining areas and infrastructure (existing visual disturbances) effectively consolidates industrial infrastructure within this node. The existing visual disturbances brought about by the Transalloys Smelter and the Highveld Steel works, and the close proximity of the proposed power plant to the smelter complex, somewhat mitigates the visual impact of the structures and activities. Ironically this will also contribute to the potential cumulative visual impact of industrial infrastructure within the region. It is however still preferable to consolidate the proposed infrastructure in areas of existing visual disturbance, rather than to spread it over larger areas.

### *8.3.8. Potential Cumulative Socio-economic impacts*

The existing and potential developments in the area present the potential for a number of cumulative socio-economic impacts. Impacts in this regard are expected to be both positive and negative and could occur during the construction and operational phases of the projects.

It is highly likely that if some or all of the proposed projects are approved by government, the demand for goods and services required for construction of similar facilities would grow. This could provide sufficient economies of scale and thus open opportunities for job creation, skills development and the establishment of new industries in the country and new businesses in the local area, including sectors that are not well-developed in the local economy. This could present positive socio-economic impacts at a local and regional scale as a result of economic upliftment, reduction of poverty and improvement in living conditions.

Numerous developments planned for the area will most likely increase the number of job seekers migrating into the area which could have subsequent social impacts (such as conflict with local residents) and would place pressure on local services and housing availability. In addition, numerous developments in the area would impact on land available for ecological or agricultural use.

The cumulative impacts which will arise from the realisation of all of these projects will certainly have an impact on the natural environment, but the majority of impacts are likely to be registered by nearby communities (most notably Clewer which is situated adjacent to all these proposed projects) as cumulative noise, air quality and visual impacts.

## 8.4 Conclusions Regarding Cumulative Impacts

Water and coal are key natural resources which drive the development of mines and power station developments. The eMalahleni area is an identified node for coal and energy. Water is not currently a limiting factor in the area, although this is likely to become limiting in the future.

The development of the proposed Transalloys Power Station along with several other coal-fired power stations in the region will have negative and positive cumulative environmental, social and economic impacts. It is essential that each new coal-fired power station and related coal-developments (such as new coal mines) subscribe to sound environmental management during these projects' life-cycle (construction, operation, decommissioning and rehabilitation phases). This would require input from regulating authorities and applicants during the development of coal and power station projects in the region to ensure that cumulative environmental impacts are managed to acceptable levels.

# CONCLUSIONS AND RECOMMENDATIONS CHAPTER 9

Transalloys (Pty) Ltd, a producer of export grade Siliconmanganese, as an energy intensive electricity user, proposes to develop a Coal-Fired Power Plant and associated infrastructure adjacent to its smelter complex near eMalahleni, Mpumalanga Province. Unreliable national energy supply is affecting the company's productivity to such an extent, that should the proposed power station not be constructed (thereby reducing reliance on the Eskom grid) and also taking into account the rising cost of electricity, that the business will suffer significant financial losses, having downstream impact on shareholder profits and viability of the business, potentially leading to job losses and even closure.

The development of a power plant of up to 150MW has been assessed in this EIA, however, based on a re-evaluation of the need and desirability, as well as the potential environmental impact of the 150MW alternative on some environmental aspects, a reduction in the generating capacity of the plant to 55MW is proposed to meet Transalloys' current electricity demands and future expansion requirements. The development of the power plant project would effectively mean that Transalloys would become less dependent of the Eskom electricity grid, thereby creating additional capacity within the Eskom grid for use by other electricity users and providing greater confidence in supply of energy for operational purposes.

The construction phase is expected to extend over a period of 18 months and create approximately 400 employment opportunities. The operational phase will employ approximately 44 people full time for a period of up to 25 years or more.

The main infrastructure that is required for the Transalloys 55MW coal-fired power station includes:

» Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room).
» Ash disposal facility and runoff ponds.
» Dams for storage and separation of "clean" and "dirty" water.
» Raw water pipeline.
» Coal and limestone offloading and storage areas.
» Ash silos.
» Facility conveyor belts.
» Water and wastewater treatment facilities and raw water reservoir.
» Evaporation pond.
» A 33kV overhead power line from the switchyard to connect into the existing Transalloys Substation.

» General and hazardous waste storage area.
» Internal access roads.
» Other operational support and administrative buildings.

The environmental impact assessment (EIA) for the proposed Transalloys Power Station has been undertaken in accordance with the EIA Regulations of June 2010 (as amended), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed project.
» Comparatively assess identified alternatives put forward as part of the project.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

## 9.1. Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within Appendices E - O provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the EIA process by providing a summary of the conclusions of the assessment of the proposed Transalloys Power Station and associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project.

Impacts associated with the project relate to the following:

» Impacts associated with the power station and associated infrastructure, including linear infrastructure such as the power line and raw water pipeline.

» Impacts associated with waste treatment and management activities.

### *9.1.1. Impacts associated with the proposed power station and associated infrastructure*

All components of the proposed Transalloys Power Station will be located on land owned by Transalloys. The proposed project site is ideally situated due to its proximity to the existing Transalloys smelter complex and is also considered technically feasible on the basis of availability of the fuel resource (i.e. coal from nearby mines), availability of grid connection, water availability and site access.

Five site alternatives of suitable size were investigated during the Scoping process and through technical and environmental evaluation, two sites were selected as being required and suitable for the siting of the power station and ash disposal facility. Both sites are required for the development of the 150MW design alternative with the implication being that the environmental impacts are higher due to the greater project footprint extending into sensitive environments and closer to social receptors (refer to Figure 9.1).

The development of the entire 55MW project footprint (as well as ash disposal facility) on site 1, thereby excluding site 2 from the development area, will in itself serve as mitigation of virtually all land-use environmental impacts included in this assessment to a large extent. From this perspective the 55MW alternative is considered to be preferred (refer to Figure 9.2). This layout has been further refined so that linear infrastructure can follow existing linear infrastructure including roads and furrows as far as possible.

Potential impacts associated with the proposed power station are expected to occur during both the construction and operational phases. No absolute no go areas were identified from the specialist studies undertaken, although areas of sensitivity were identified

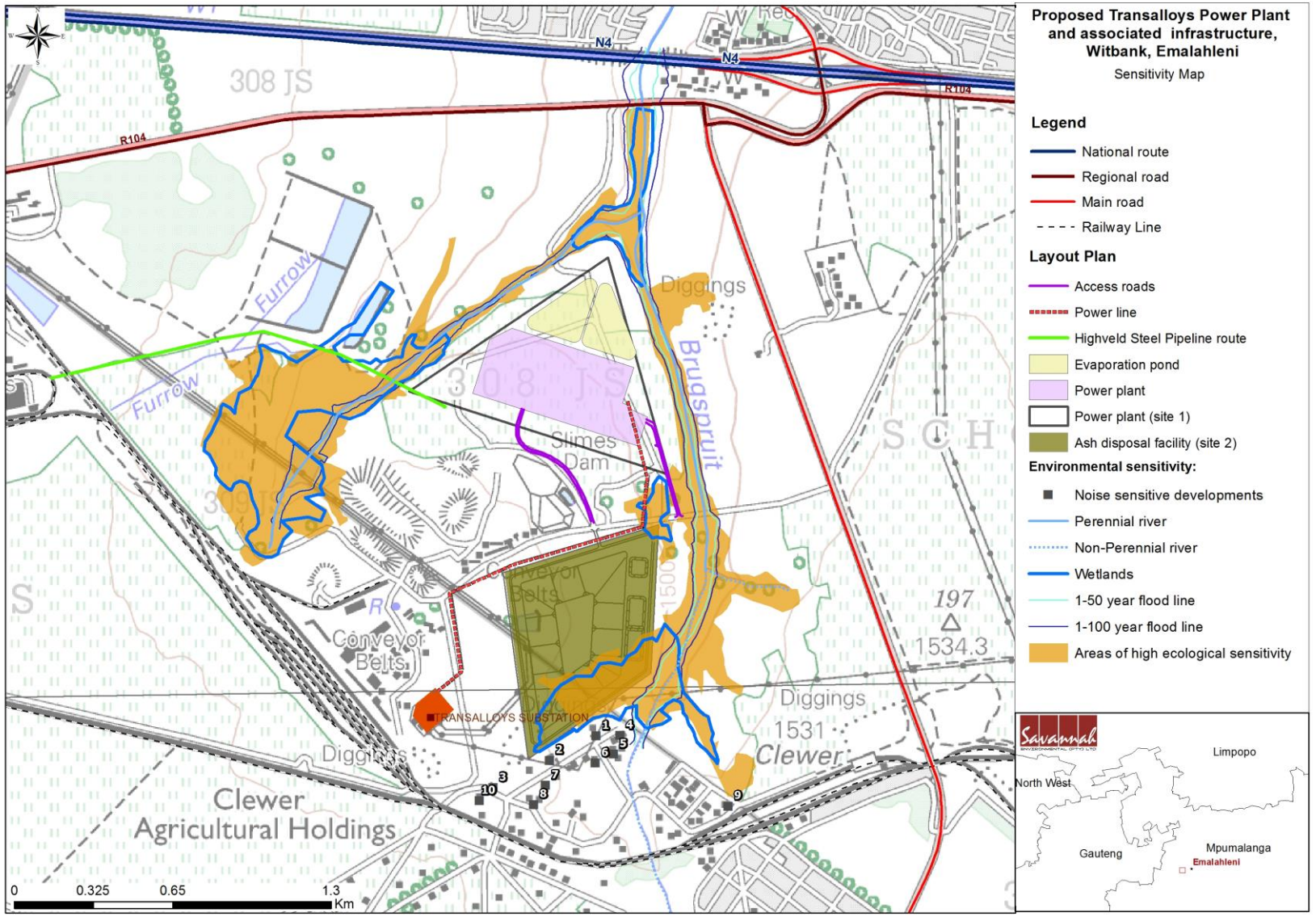



**Figure 9.1:** Environmental Sensitivity Map overlay of 150MW power plant alternative

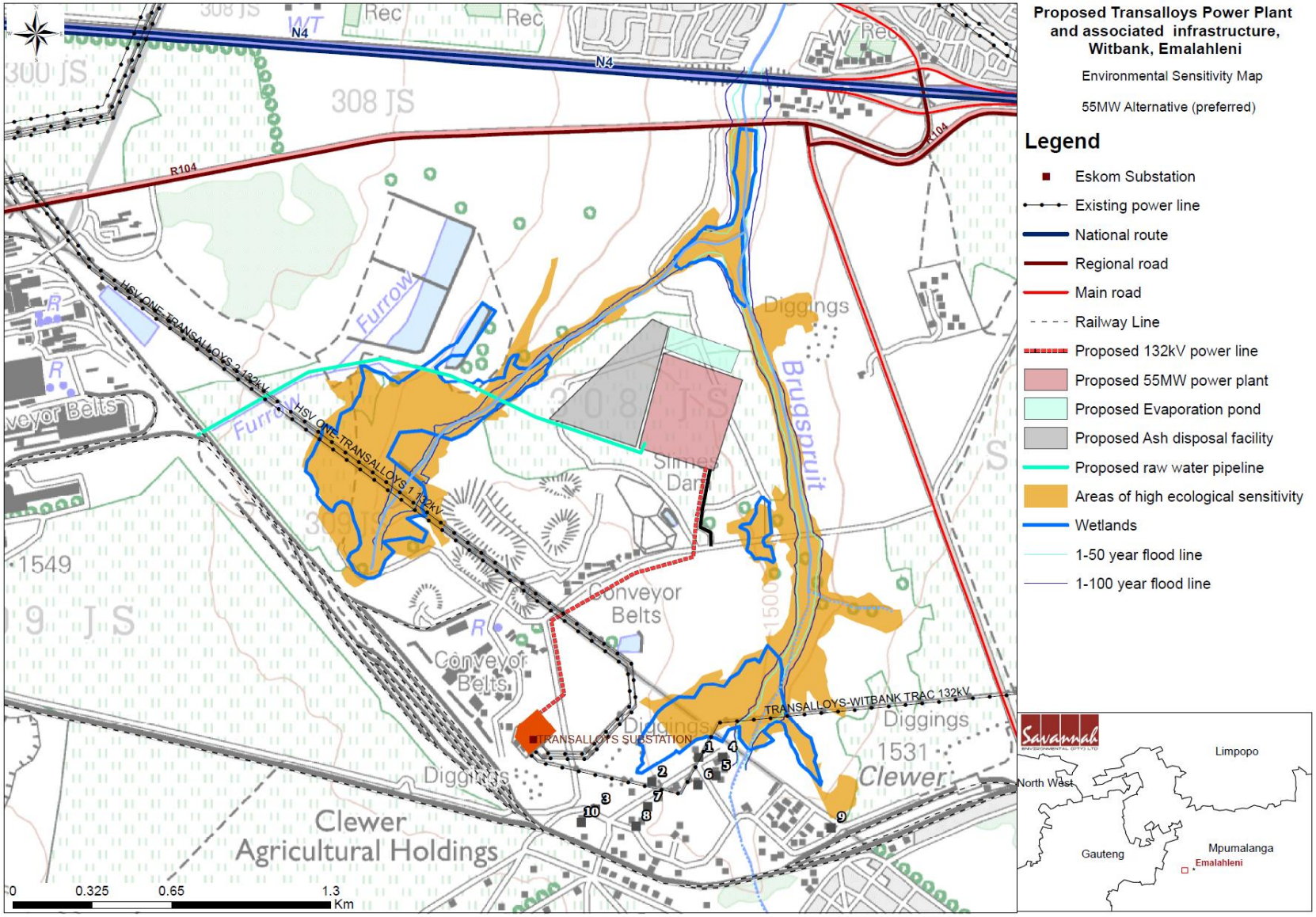



**Figure 9.2:** Environmental Sensitivity Map overlay of 55MW power plant alternative (preferred)

Impact sources associated with the proposed power station and associated infrastructure are expected to include:

» ***Biodiversity impacts*** associated with the construction of the power station and associated infrastructure. While most of the expected impacts associated with this development to the actual footprint will be unavoidable, the success of mitigation will be determined by the success of preventing impacts from spreading outside the footprints of the development. Aspects such as infestation of surrounding habitat by alien and invasive species, the introduction of non-endemic and invasive animals, dust, effluents, contamination, hydro-carbons spillages, etc. will represent the ultimate challenge of the environmental management plan as these aspects will cause the spread and exacerbation of impacts into the natural environment caused by the development. The major objective of the environmental management programme of the development should therefore be the complete prevention and containment of any impact from the development that might cause harm to areas of surrounding natural habitat, with particular emphasis on avoiding or limiting impacts as far as possible on the aquatic environment (i.e. the Brugspruit and its western tributary as well as the wetlands in the area).

  Ultimately, the expected loss of natural resources from the site and immediate surrounds as a result of the development will result in impacts of low significance and will be highly localised. No protected plant and animal species were identified in the study area which will be adversely affected by the proposed project.

  Impacts of a cumulative nature, although estimated to result in moderate and low significance, represent a continuous, low level threat to biodiversity on a local and regional scale. The increase in industrial and mining activity in the region implies constant losses of natural habitat and species. This is exacerbated by the decline in environmental quality caused by peripheral and indirect impacts such as species invasion, degradation, contamination, disruption of ecological processes, habitat fragmentation and isolation, etc.

  In conclusion however, no specific impact was identified that would render the proposed development as an unacceptable threat to the biological environment or any specific aspect or species that are known to occur, or could potentially occur within the study area or required servitudes, provided that detailed, comprehensive and sensible environmental management principles are applied throughout the lifetime of the operation.

» ***Impacts on Soils and Agricultural Potential*** associated with the construction phase (soil loss and erosion) and the operational phase (permanent loss of agricultural land). The development of the power station will have **low to medium negative impact** on agricultural resources and productivity. The significance of all agricultural impacts is influenced by the fact that the land potential is limited due to soil depth and moisture holding constraints and pressures in terms of mining use. Erosion potential could increase in areas disturbed on the site during construction unless appropriate mitigation is implemented. Impacts in this regard are however expected to be of **low significance**.

There are no fatal flaws associated with agriculture on the site and the project can therefore be developed, with the use of good soil management measures, during all its phases

» ***Impacts on Surface and Groundwater Resources*** related to construction and operation of the power station. Impacts on water resources are related to quality and quantity. Impacts on water quantity are not expected as water is not proposed to be abstracted from a natural resource in the area, but will rather be obtained from nearby industrial water users with a water surplus. As proposed for the project, the implementation of dry cooling and dry ashing is the preferred technology in order to minimise water required thereby reducing impacts on water resources. Impacts on water quality relate to sedimentation and contamination during both the construction and operational phases of the project. These impacts can be successfully managed through the implementation of appropriate mitigation and management measures, such as liners for the ash disposal facility and coal stockpile areas, and implementation of dust suppression measures on exposed surfaces. Impacts on water resources are expected to be of **Medium to Low significance**. On-going water quality monitoring throughout the operational phase is required to be undertaken.

***Impacts on wetlands*** associated with the construction of the power station and associated infrastructure. Five wetlands were identified in the study area of the valley bottom (associated with the Brugspruit) and hillslope seepage variety. While a significant impact is expected over a section of hillslope seepage wetland identified on the project site for the siting of the ash disposal facility (for the 150MW design alternative), the loss of the wetland was deemed to constitute acceptable loss, due to the degraded present ecological state of the wetland and the opportunity to rehabilitate other nearby wetlands of conservation value as a mitigating condition of the project. The overall impact on the wetland proposed to be lost to development will however remain **High significance**. This impact is in itself mitigated by the

development of the 55MW design alternative, which does not require the siting of the ash disposal facility within delineated wetland systems.

» ***Impacts on air quality and human health*** associated with the construction phase (dust) and the operational phase (emissions from the power station and PM from the ash disposal facility). The area is dominated by winds from the east and east-south-east. Impacts associated with the construction phase will be limited largely to the Transalloys smelter complex with no exceedences at the air quality sensitive receptors. Impacts are expected to be of **low significance**. Impacts during operation relate to dust from the ash disposal facility and coal stockpile as well as emissions ($SO_2$, $NO_2$ and $PM_{10}$) from the power station. From the results of the modelling undertaken, the release of $PM_{2.5}$, $PM_{10}$ and $NO_2$ during the operational phase are expected to result in exceedances of both long term (annual) and short term (1-hour and/or 24-hour) ambient air quality criteria off-site. Furthermore, dustfall as a result of unmitigated PM emissions is expected to exceed the criteria for residential areas at the closest residences of Clewer. Impacts are expected to be of **medium significance** when unmitigated for all emissions. Development of the 55MW design alternative are unlikely to result in adverse air quality impacts at the identified receptors.

» ***Noise impacts*** associated with the construction (short-term) and operational (long-term) phases. Impacts are expected to be more significant during the night (22:00 – 06:00) than during the daytime (i.e. 06:00 – 22:00). Impacts during the construction phase are expected to be of **low significance** while impacts during the operational phases are also considered to be of **low significance** due to the existing ambient noise conditions. No mitigation or routine noise monitoring is therefore required in the operation phase of the facility.

» ***Visual impacts*** associated with the 150MW power station and associated infrastructure. Potential visual impacts are expected to be of **Medium significance** and mostly restricted to within 10km of the site. The consolidation of the proposed infrastructure in areas of existing visual disturbance is however preferred (as proposed by the current siting and layout arrangements), rather than the distribution thereof over larger areas. The visual impact is further mitigated if the 55MW design alternative is developed resulting in a much reduced visual profile of the project.

» ***Impacts on Heritage Sites*** during the construction phase. A cemetery, two initiation sites and the demolished remains of structures were identified during the heritage survey, of which the latter are not considered to be of heritage significance. The cemetery and initiation sites will not be impacted by

construction activities. Impacts to the heritage environment are considered to be of **low significance**. From an archaeological point of view there is no reason why the development should not proceed.

» ***Traffic impacts*** associated with construction and operation of the power station. The traffic volumes generated by the proposed Transalloys Power Station development will have an additional impact on the external road network. The potential impact is considered to vary significantly between the 55MW and 150MW design alternatives. However road improvements are expected to be required irrespective of whether the proposed development continues or not in order to address access and safety provisions. Furthermore the onus is on the relevant roads authorities to address the recommended road improvements. It is expected that this will be done in light of the number of proposed mining projects in the area. It is recommended that Transalloys engage the traffic authorities in order to determine expectations in this regard.

» ***Socio-economic impacts*** expected during both the construction and operation phases of the proposed project. The construction and operation of the power station is expected to have both negative and positive social and economic effects. From a socio-economic perspective, the positive effects in terms of construction, operation, and decommissioning of the coal-fired power plant include an increase in national electricity capacity (or relief to the Eskom grid), economic development, job creation, increase in household income, and government revenue.

The town of Clewer is the most directly affected social receptor which will be the most prone to impacts arising from air quality, noise and visual impacts. These impacts are expected to be mitigated to a large extent through the development of the 55MW design alternative over the 150MW design alternative.

Importantly, most of the negative impacts will be limited to the local economy or surrounding area, while positive effects will accumulate to the local and national economies. The findings of the SIA indicate that the development of the proposed power station will create employment and business opportunities for locals during both the construction and operational phase of the project. The significance of this impact is rated as High Positive. By establishing their own energy generation capacity Transalloys are not only addressing their own needs, but are also reducing the future energy demand on Eskom, which, in turn creates benefits for other energy users in South Africa.

Considering that many of the negative impacts will also be possible to mitigate, although not completely eliminate, the trade-offs between negative and positive effects suggest that from the socio-economic perspective the project should be approved for development. It will contribute to achieving local and national government developmental objectives at a relatively limited cost. Nonetheless, it is imperative that the construction, operation, and decommissioning of the project should be conducted in the most sustainable way with the primary objective of minimising, and where feasible, completely eliminating the potential for deterioration of human livelihoods, reducing business turnover, and altering the environment in the proposed area.

From the above conclusions of the specialist studies undertaken, it is concluded that the impacts associated with the construction and operation of the power station and associated infrastructure are expected to be predominantly of Medium to Low significance with the implementation of appropriate mitigation measures. No environmental fatal flaws were identified to be associated with the proposed project.

### *9.1.2. Impacts associated with waste treatment and management activities*

Impacts associated with waste treatment and management activities relate to those associated with the ash disposal facility and the wastewater treatment works. Potential impacts on surface and groundwater are anticipated should appropriate mitigation measures not be implemented. In terms of the assessment of impacts undertaken within this EIA study, Impacts on water resources are expected to be of **Medium to Low significance**. These impacts would be as described above.

## 9.2. Overall Conclusion (Impact Statement)

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that:

» The 55MW design alternative is preferred over the 150MW design alternative due to an anticipated reduction in the significance of the identified environmental impacts.
» The impacts associated with the construction and operation of the power station and associated infrastructure are expected to be of Medium to Low significance with the implementation of appropriate mitigation measures.
» No 'no-go' areas were identified within the project development area.

» No environmental fatal flaws were identified to be associated with the proposed project.
» From the assessment of the raw water supply pipeline alternatives considered, the option to convey water from EVRAZ Highveld Steel is considered to be the alternative which would result in the lower impact on the environment. The alignment of the water pipeline from the proposed Transalloys power plant to EWRP, is also considered to be acceptable from an environmental perspective, although approval of the route should be sought from AngloAmerican as the surface rights holder along the route, should this option be required for any technical reason.
» Dry cooling and dry ashing are considered to be the preferred options as these will minimise the requirements for water.

## 9.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the potential impacts of the proposed Transalloys Power Station (50MW alternative) can be mitigated to acceptable standards on condition that the mitigation measures specified in Chapter 7 and within the EMPr are observed and implemented. It is further submitted that the 150MW design alternative, subject to the implementation of mitigation measures, is also considered to be environmentally acceptable based on the findings of the study.

Should authorisation be granted, the following conditions must be included within the authorisation issued for the 55MW design alternative:

Management and compliance monitoring
» All mitigation measures detailed within this report and the specialist reports contained within Appendices E to O must be implemented.
» The draft Environmental Management Programme (EMPr) as contained within Appendix P of this report must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.
» An independent Environmental Control Officer (ECO) must be appointed by the project developer prior to the commencement of any authorised activities. The ECO must monitor compliance with all applicable environmental legislation and requirements throughout the construction phase.

Design

» The infrastructure should be limited to Site Alternative 1 as far as reasonably possible.
» Following the final design of the facility, a final layout indicating all relevant infrastructure and affected areas (permanent and temporary) must be submitted to DEA for review and approval prior to commencing with construction. This layout must consider all sensitive areas identified within the site.
» Develop and implement a stormwater management plan for the stormwater and water pollution control facilities such as Pollution Control Dams and storm water drainage system. Pollution control infrastructure is required to be designed in accordance with Regulation 636 of August 2013 published in terms of the NEM: Waste Act (Act No 59 of 2008).
» An appropriate liner system must be installed at the ash disposal system to be designed in accordance with Regulation 636 of August 2013 published in terms of the Waste Act.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.

Biodiversity maintenance and integrity
» A detailed Alien and Invasive Plant Management Plan must be developed and implemented throughout the project cycle up to the decommissioning phase.
» A rehabilitation programme that makes use of locally endemic or indigenous species must be developed and implemented.

Air quality management
» Design and implement an air quality management plan for the operational phase of the power station. This should include ambient air quality monitoring and an emission control and reduction strategy to ensure that the contribution to ambient concentrations is minimised. Cognisance of the management plan for the Highveld Priority Area is taken cognizance of.

Surface water and wetlands
» Transalloys should continue with its surface water monitoring programme to ensure that it can characterise its impact on the Brugspruit and its tributary.
» A stormwater management plan demonstrating the separation of clean and dirty stormwater flows must be prepared.
» A Water Use License must be obtained from the Department of Water and Sanitation.

Groundwater
» The current groundwater monitoring program must continue in order to accurately determine the impacts that the new plant will have on the groundwater quality downstream.

» Material from the coal stockpile and ash disposal facility should be submitted for geochemical analysis to determine the leachability, acid generation capacity and contamination potential of each.

Waste management

» Monitoring of waste treatment and management facilities throughout all phases of the project should be undertaken.
» An Integrated Water and Waste Management Plan (IWWMP) for all phases of the project should be developed.

Noise monitoring

» No mitigation or routine noise monitoring is required in the operation phase of the facility however if noise measurements are conducted annual feedback should be presented to all stakeholders and other Interested and Affected parties in the area.

Traffic management

» Develop and implement a traffic management plan for the construction and operational phases of the power station. This is of particular importance should the recommended traffic/intersection improvements not be effected timeously by the appropriate roads authorities.

Heritage

» Ensure that construction phase impacts on the cemetery site are avoided. Fence the cemetery site and provide an access gate for family members.

Social impacts

» During the design and construction phase the developer should meet with local communities (Clewer) to determine their concerns and take into consideration any mitigating proposals.
» Increase the local procurement practices and employment of people from local communities as far as feasible to maximize the benefits to the local economies.

Mineral consent

» A Section 53 Application should be submitted to the DoE to ensure that proposed activities do not sterilise a mineral resource that might occur on site.

Pre-construction

» Prior to construction of the water pipeline, a survey of the pipeline route should be undertaken to determine whether any protected plant species are

present in the servitude, namely *Satyrium longicauda.* A permit for the removal of this species should be sought if detected.

Rehabilitation and operations

» Site rehabilitation of temporary laydown and construction areas are to be undertaken immediately after construction.
» The process of communication and consultation with the community representatives must be maintained after the closure of this EIA process, and, in particular, during the construction phase associated with the proposed project.

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