ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROPOSED ESTABLISHMENT OF A COAL-FIRED POWER STATION AND ASSOCIATED INFRASTRUCTURE - IPP THABAMETSI POWER STATION NEAR LEPHALALE LIMPOPO PROVINCE
(DEA Ref No: 14/12/16/3/3/3/40)

FINAL REPORT

MAY 2014

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/3/40
NEAS Reference No.		DEA/EIA/0001296/2012
Title	:	Environmental Impact Assessment Process Final EIA Report: Proposed Establishment Of A Coal-Fired Power Station And Associated Infrastructure - IPP Thabametsi Power Station Near Lephalale, Limpopo Province
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Project Developer	:	Newshelf 1282 (Proprietary) Limited
Report Status	:	Final Environmental Impact Assessment Report

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PURPOSE OF THE EIA REPORT

Newshelf 1282 (Proprietary) Limited (the "Project Company"), an Independent Power Producer (IPP) is proposing the construction of a coal-fired power station (the "Project") on a site near Lephalale in the Limpopo Province. This project was previously presented by Exxaro Resources, who subsequently selected the Project Company as a preferred IPP for the development of the power station.

The proposed coal-fired power station will have a generating capacity of up to 1 200 MW which is intended to provide electricity for integration into the national grid. The purpose of the proposed IPP Thabametsi Power Station is to provide baseload power to the national electricity grid.

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 prior to the commencement of construction of the project. The Project Company has appointed Savannah Environmental, as the independent Environmental Assessment Practitioner (EAP), to undertake the required Scoping and EIA process to identify and assess all the potential environmental impacts associated with the proposed project and propose appropriate mitigation and management measures in an Environmental Management Programme (EMPr).

This Draft 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
» **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 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 assesses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, 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.

The release of a draft EIA Report provided stakeholders with an opportunity to verify that the issues they raised were captured and adequately considered within the study. This Final EIA Report incorporates all issues and responses received during the EIA process. This report is submitted to the National Department of Environmental Affairs (DEA), the decision-making authority for the project. Changes made from the Draft EIA Report to this Final EIA Report **have been underlined throughout** this Final EIA Report for ease of reference.

PUBLIC REVIEW PERIOD FOR THE FINAL SCOPING REPORT

The release of this Final EIA Report provides stakeholders with an additional opportunity (21 days) 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 received during the process. As required in terms of Regulation 56(2) of the EIA Regulations, this report has been made available for public review prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project. The report is available for download at www.savannahsa.com/projects. CD copies are available on request from the Savannah Environmental contact person below.

Comments on the Final EIA report must be submitted in writing to the National Department of Environmental Affairs and copied to Savannah Environmental, as per the requirements of Regulation 56(5) of the EIA Regulations.

Relevant contact details are as follows:

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EIA INFORMATION LIST – DEA & LEGAL REQUIREMENTS

Savannah Environmental has compiled a table (refer to Table 1 below) which outlines the DEA requirements as outlined in the acceptance of the scoping report dated 20 March 2013, and where in the final EIR the requirements have been addressed within this report for ease of reference.

Table 1: Information requested by DEA

1	INFORMATION REQUIREMENTS	CROSS REFERENCE IN THIS EIA REPORT
1	• Ensure comments from all stakeholders are included in the FEIR. • Proof of correspondence with stakeholders must be included in the FEIR	Refer to Appendix D2
2	• Conceptual design of wastewater treatment works must be included in the FEIR • Technology alternatives of wastewater treatment works must be discussed in detail in the FEIR • Use of sketches when describing the wastewater treatment works	Chapter 3 and Appendix A
3	Facility illustration of the disposal facility must be included in the FEIR	Appendix A
4	Quantity of waste to be stored and the period of storing waste should be indicated in the FEIR	Chapter 3
5	Frequency of removal of various waste types must be indicated	Chapter 3 and Appendix P
6	The total footprint of the entire development should be indicated. Exact locations of the proposed development and associated infrastructure should be mapped at an appropriate scale	Appendix A
7	Should a water use license be required, proof of application of a license needs to be submitted	Chapter 3
8	Possible impacts and effects of the development on the surrounding land use area	Chapter 7 and 8
9	Information on services required on the site, who will supply these services and has an agreement and confirmation of capacity been confirmed?	Chapter 3
10	A construction and operational phase EMP to include mitigation and monitoring measures	Appendix P
11	Include at least one A3 map of the area and locality maps of the area to illustrate the different alignments and the above ground storage of fuel.	Appendix A and Appendix Q

LEGAL REQUIREMENTS IN TERMS OF THE EIA REGULATIONS

Table 2 below details how the legal requirements of Section 31 of the EIA Regulations (EIA Report content) have been addressed within this report

Table 2: Legal Requirements for EIA Report

NEMA REGULATIONS GNR 543, SECTION 31 REQUIREMENTS FOR THE CONTENT OF ENVIRONMENTAL IMPACT ASSESSMENT REPORTS	**CROSS REFERENCE IN THIS EIA REPORT (refer to the following parts in the report)**
(a) details of— (i) the EAP who prepared the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment;	Chapter 1 & Appendix B
(b) a detailed description of the proposed activity	Chapter 3
(c) a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is— (i) a linear activity, a description of the route of the activity; or (ii) an ocean-based activity, the coordinates where the activity is to be undertaken	Chapter 3
(d) a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity	Chapter 6
(e) details of the public participation process conducted in terms of sub-regulation (1), including— (i) steps undertaken in accordance with the plan of study; (ii) a list of persons, organisations and organs of state that were registered as interested and affected parties; (iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and (iv) copies of any representations and comments received from registered interested and affected parties	Chapter 5 Appendix D
(f) a description of the need and desirability of the proposed activity;	Chapter 2 & 3
(g) a description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Chapter 4
(h) an indication of the methodology used in determining the significance of potential environmental impacts	Chapter 5
(i) a description and comparative assessment of all alternatives identified during the environmental impact assessment process	Chapter 7

NEMA REGULATIONS GNR 543, SECTION 31 REQUIREMENTS FOR THE CONTENT OF ENVIRONMENTAL IMPACT ASSESSMENT REPORTS	**CROSS REFERENCE IN THIS EIA REPORT (refer to the following parts in the report)**
(j) a summary of the findings and recommendations of any specialist report or report on a specialised process	Chapter 7
(k) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues	Appendix D
(l) a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	Chapter 7 Appendices F - O
(m) an assessment of each identified potentially significant impact, including— (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact can be reversed; (vi) the degree to which the impact may cause irreplaceable loss of resources; and (vii) the degree to which the impact can be mitigated	Chapter 7 Appendices F - O
(n) a description of any assumptions, uncertainties and gaps in knowledge	Chapter 3 Appendices F - O
(o) a reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Chapter 9, Section 9.3
(p) an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment; and (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	Chapter 9, Section 9.2
(q) a draft environmental management programme containing the aspects contemplated in regulation 33	Appendix P
(r) copies of any specialist reports and reports on specialised processes complying with regulation 32	Appendix E - O
(s) any specific information that may be required by the competent authority.	Refer to Table 1 above

EXECUTIVE SUMMARY

Background and Project Overview

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. The Integrated Resource Plan (IRP) 2010 developed by the Department of Energy 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 order to meet this required generation capacity, the IRP includes a mix of generation technologies, including 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.

In response to the need for additional electricity supply to the national grid, and the goal of Government to procure electricity from Independent Power Producers (IPPs), as detailed in the IRP 2010, Newshelf 1282 (Proprietary) Limited (the "Project Company") is proposing the construction of a coal-fired power station on a site near Lephalale in the Limpopo Province. The power station would have a capacity of up to 1 200 MW (to be developed in two phases of 600MW each). This capacity is constrained by the available water, as well as constraints associated with grid integration.

The proposed site is located approximately 26km north-west of Lephalale within the Lephalale Local Municipality, in the Waterberg District Council of the Limpopo Province. The site is located within the Waterberg Coal Fields, in close proximity to a proven coal resource (to be mined by the Thabametsi Coal Mine to be developed by Exxaro Resources). Various alternative sites for the construction of the proposed Power Station were considered in the scoping phase of the project, i.e.: Onbelyk 257 LQ, Gelykebult 455 LQ, Gelykebult 450 LQ, Eendragtpan 451 LQ, and Vooruit 449 LQ (Refer to **Figure 1**). The Farm Onbelyk 257 is the technically preferred site for the power station and was determined to be the environmentally preferred site from the studies undertaken in the Scoping Phase of the EIA process, and is further assessed in this EIA Report. A draft layout of the infrastructure for the power station is provided in Appendix A.

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. This ensures a plant with relatively low emissions.

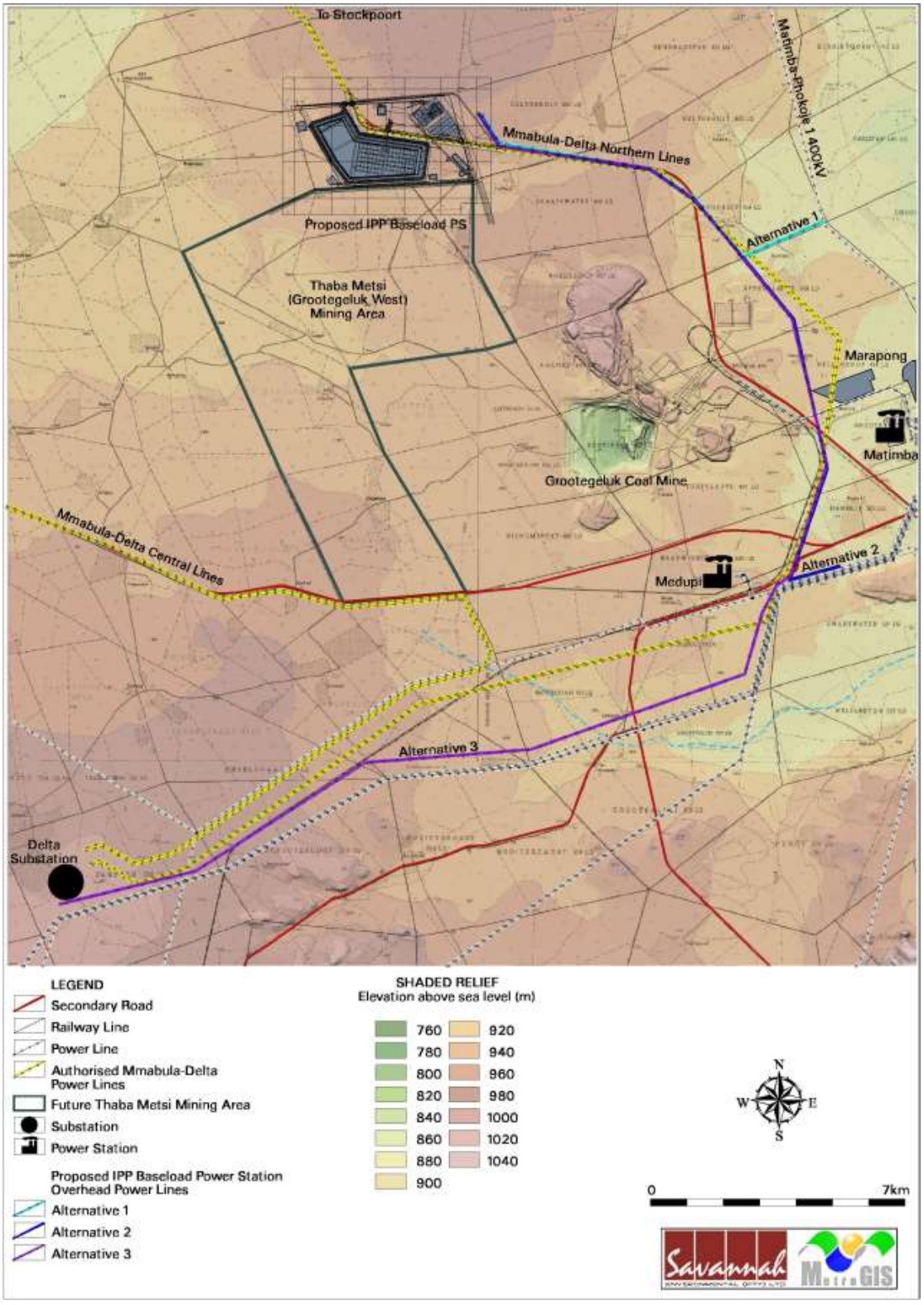


Figure 1: Locality map indicating the location of the proposed power station and power line alternatives

In addition, the power station will utilise dry cooling technology and dry ashing due to water availability constraints.

The main infrastructure that is required for the IPP Thabametsi coal-fired power station includes *(specifications will be determined based on the technology selected):*

» Access roads.
» Coal storage areas and bunkers. Coal is to be provided to the power station from the new Thabametsi mine proposed to be established to the south-east of the site (refer to Figure 1.1).
» Pipeline for water supply. Water is to be supplied from the allocation to Exxaro Coal from the Mokolo-Crocodile Water Augmentation Project (MCWAP). It is also necessary to consider water supply from the Crocodile River for further expansion.
» Coal loading and offloading areas, as well as conveyor belts.
» Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room).
» Ash dumps.
» Wastewater treatment facilities (including Raw-Water Storage Dams, wastewater treatment works, purification works and reservoirs).
» A High Voltage Yard.
» Overhead power lines to connect into the Eskom grid. The power generated is planned to evacuate into the electricity grid at a point to be determined in consultation with Eskom. Three alternative power line routes have been proposed for consideration in the EIA process (refer to Chapter 3 for more details in this regard).
» Office and maintenance area/s.

Environmental Impact Assessment

In terms of the National Environmental Management Waste Act (Act No 59 of 2008), the construction of the pollution control dams require a Waste License as per GN718. As activities relevant to this proposed project are listed under Category B of GN718, a **Scoping and EIA process**, as stipulated in the EIA Regulations (2010) published under section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), is required to be undertaken.

In addition, the Project Company requires Authorisation in terms of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998) for activities listed under this legislation. As activities relevant to this proposed project are listed under GNR545, a **Scoping and EIA process**, as stipulated in the EIA Regulations (2010) published under section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), is required to be undertaken.

Should the project be authorised, application for a Water Use License and Air Emissions License will also be made to the relevant authorities.

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 assesses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, 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.

Evaluation of the Proposed Project

Impacts associated with the project relate to the following:

» Impacts associated with the power station and associated infrastructure, including the transmission lines
» Impacts associated with waste treatment and management activities

Impacts associated with the power station and associated infrastructure

All components of the proposed IPP Thabametsi Power Station, apart from the power lines, will be located within the Farm Onbelyk 257 LQ. This site was selected as being technically feasible on the basis of availability of the fuel resource (i.e. coal from the Thabametsi Mine), availability of grid connection, water availability, site access, and land availability. Through the scoping study, the site was identified as being the least sensitive of the alternatives considered from an environmental perspective.

Potential impacts associated with the proposed power station and associated infrastructure 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 (refer to Figure 2).

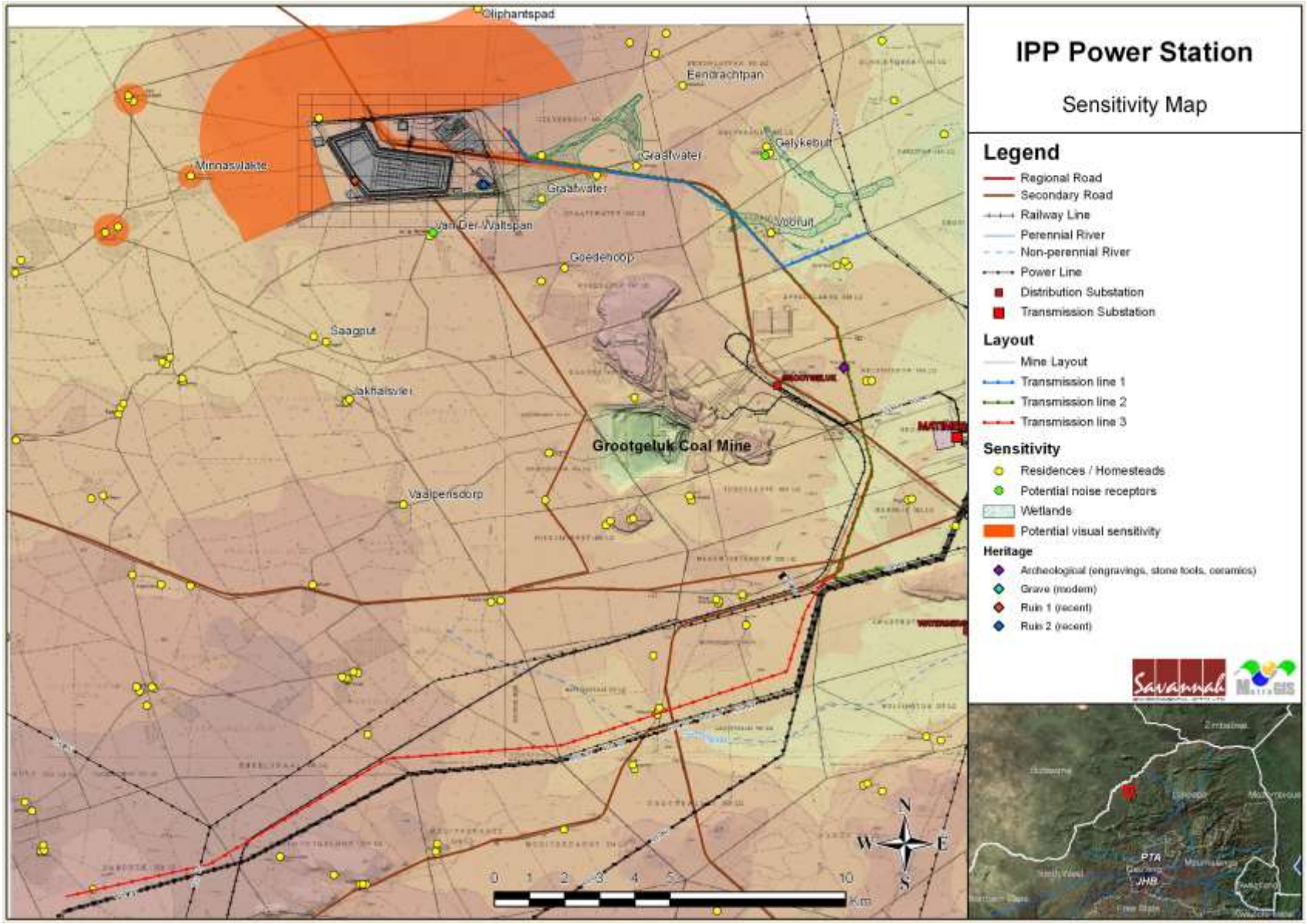


Figure 2: Sensitivity map

Impact sources associated with the power station and transmission lines 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, 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. 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.

  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. While a significant impact is expected on the protected trees that occur on the site, the conservation status and regional abundance of these species are not expected to be affected on a local or regional scale. The overall impact to pans/wetland areas for the project would be considered to be low, as mitigation measures can be adopted in order to avoid pans/wetland areas. Similarly, animals could potentially be affected severely, but the mobility of most species that are of conservation concern, renders the probability of this impact unlikely.

  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 is suitable only as non-arable, moderate potential grazing land. Soils on the site are sandy in texture and have limited water holding capacity. 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 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 through the MCWAP scheme being developed by the Department of Water Affairs. As proposed for the project, the implementation of dry cooling and dry ashing is the preferred technology in order to minimise water required therby reducing impacts on water resources. Impacts on water quality relate to sedimentation and contamination during both 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 dump and coal stockpile areas. 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. A borehole monitoring network should be established for the site in order to monitor groundwater quality.

» ***Impacts on air quality and human health*** associated with the construction phase (dust) and the operational phase (emissions from the power station). Impacts associated with the construction phase will be restricted to the Farm Onbelyk and are expected to be of low significance. Impacts during operation relate to dust from the ash dump and coal stockpile as well as emissions (SO_2, NO_2 and PM10) from the power station. From the results of the modelling undertaken, air emissions are predicted to be below the national air emission standards. Impacts are expected to be of **low significance** for all emissions. Impacts on human health are predicted to be of **low significance** at all three communities of concern (Lephalale, Onverwacht and Marapong) as well as the other off-site sensitive receptor areas investigated. It is however recommended that the highest possible stack height (i.e. 220m considered in this assessment) be implemented in order to further reduce the risk of impacts.

» ***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 both the construction and operational phases are however expected to be of low significance. No mitigation or routine noise monitoring is therefore required in the operation phase of the facility.

» ***Visual impacts*** associated with power station and associated infrastructure. Potential visual impacts are expected to be of **Medium significance**, with instances of potential **High significance** at localities in close proximity to the facility (such as the farms *Elandsvley 453 LQ, Kalkvlakte 256 LQ, Maaiamazamshoek 259 LQ* and *Minnasvlakte 258 LQ*). An issue of potential concern relates to lighting associated with the power station and the impact of this on the rural nature of the area. Mitigation measures are recommended for consideration during the detailed design phase in order to minimise visual impacts associated with the proposed project. The vegetation cover of this region is possibly the single most important element in the construction and operation of the IPP Thabametsi Power Station, and should be revered as a critical component in the mitigation and potential negation of the visual impact.

» ***Impacts on Heritage Sites*** during the construction phase. Two ruins and a grave site were identified on the power station

development site. These sites were estimated to be younger than 60 years (based on the date on the grave headstone) and are therefore not considered to be of heritage significance. Potential impacts on a heritage site of significance (Nelsonskiop) is associated with the proposed power line alternative 3, which passes in close proximity of this site. Specific management in this area would be required to minimise the risk of any impacts on this area should this alternative be selected as the preferred option. 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.

» ***Traffic impacts*** associated with construction and operation of the power station. The traffic volumes generated by the proposed IPP Thabametsi Power Station development will not have a significant impact on the external road network. In terms of the intersection and road link capacity, no further improvements are recommended since the intersections under investigation are expected to operate at acceptable level of service with the proposed upgrades in place. Good traffic management during the construction phase and operational phase will ensure that traffic impacts are limited and manageable. The findings of the traffic impact assessment for proposed IPP Thabametsi Power Station conclude that the proposed development should be favourably considered from a traffic engineering point of view by the relevant authorities. .

» ***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-based power plant include an increase in national electricity capacity, economic development, job creation, increase in household income, and government revenue. However, the coal-based power station will be associated with a number of other negative effects that are more challenging to quantify and to offset. These are associated with the sense of place, property values, social pathogens, standards of living, and pressure on socio-economic infrastructure. 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.

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*** associated with the development of numerous industrial type developments in the region. Water and coal are key natural resources which drive the development of mines and power station developments. The Waterberg area is an identified node for coal and energy having been included as part of the Coal, Energy and Petrochemical Cluster identified by government. St this stage, more than 50% of South Africa's remaining coal reserves are located within the Waterberg Coalfield. Due to the development of the MCWAP by DWA, water is not currently a limiting factor in the area, although this is likely to become limiting in the future.

The development of the IPP Thabametsi Power Station along with at least two other coal-fired power stations in the Waterberg coal-field 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.

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 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.

Impacts associated with waste treatment and management activities

Impacts associated with waste treatment and management activities relate to those associated with the ash dump 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. A borehole monitoring network should be established for the site in order to monitor groundwater quality. In addition, an appropriate Integrated Water and Waste Management Plan (IWWMP) must be developed and implemented for all phases of the proposed project.

Selection of Preferred Power Line Alternative

In general, the nature and extent of impacts identified to be associated with the power line alternatives is dependent on the alignment which is selected. From the specialist studies undertaken, various conclusions have been drawn regarding the preferred alternative for establishment of the power line.

In terms of the conclusions of the specialist studies, all alternatives are considered to be acceptable. Alternative 3 is the least preferred from all aspects as it is the longest in length. This route follows a portion of the authorised Mmamabula-Delta power line corridor and is therefore not expected to present any fatal flaws. Alternative 1 is considered to be the most preferred in terms of all aspects apart from socio-economic considerations. In terms of socio-economic impacts, Alternative 2 is only slightly preferred over Alternative 1. On the basis of these conclusions, **Alternative 1** is nominated as the preferred alternative from an environmental perspective. However, as all alternatives are considered to be acceptable from an environmental perspective, the final determination of the preferred power line alternative should be made on the basis of technical considerations in consultation with Eskom.

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 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. The project is considered to be acceptable from an environmental perspective.

» No 'no-go' areas were identified within the project development area or along the power line routing alternatives, although some areas of sensitivity were identified (refer to Figure 2).
» No environmental fatal flaws were identified to be associated with the proposed project.
» From the assessment of the alternative power line alternatives, **Alternative 1** is considered to be the alternative which would result in the lower impact on the environment. However, as all alternatives are considered to be acceptable from an environmental perspective, the final determination of the preferred power line alternative should be made on the basis of technical considerations in consultation with Eskom.
» The significance levels of the majority of identified negative impacts can be minimised by implementing the recommended mitigation measures.

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 IPP Thabametsi Power Station and associated infrastructure be authorised by DEA.

The following conditions of this recommendation must be included within the authorisation issued:

» 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.
» 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.
» An independent Environmental Control Officer (ECO) must be appointed by the project developer prior to the

commencement of any authorised activities.

» Conduct an ecological walk through survey for the power station and all associated infrastructure including power lines. Results of this survey will guide permitting requirements for the removal of protected trees from the selected property.
» Conduct a heritage and paleontological walk through survey for the power station and all associated infrastructure including power lines. Any heritage sites recorded during this survey could be mitigated by micro adjustments of the layout or through the recording of the site prior to destruction.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
» Monitoring of waste treatment and management facilities throughout all phases of the project.
» Develop and implement an Integrated Water and Waste Management Plan (IWWMP) for all phases of the project.
» Develop and implement a traffic management plan for the construction and operational phases of the power station
» 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 to be designed in accordance with GNR 704 and GNR 636 specifications.
» Design and implement an air quality management plan for the operational phase of the power station. This should include an emission control and reduction strategy to ensure that the contribution to ambient concentrations is minimised.
» A detailed Alien and Invasive Plant Management Plan must be developed and implemented throughout the project cycle up to the decommissioning phase.
» Develop a rehabilitation programme that makes use of locally endemic species.
» Site rehabilitation of temporary laydown and construction areas 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.
» Applications for all other relevant and required permits required to be obtained by the developer must be submitted to the relevant regulating authorities.

TABLE OF CONTENTS

PAGE

APPENDICES

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.

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 of time and can include both direct and indirect impacts.

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.

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 (EIA), 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 on-going maintenance after implementation.

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

Indirect impacts: Indirect or induced changes that may occur as a result 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 as a result 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 general public.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

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.

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CBOs	Community Based Organisations
CO_2	Carbon dioxide
DEDET	Limpopo Department of Economic Development, Environment and Tourism
DEA	National Department of Environmental Affairs
DME	Department of Minerals and Energy
DOT	Department of Transport
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
km^2	Square kilometres
kV	Kilovolt
m^2	Square meters
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

INTRODUCTION CHAPTER 1

Newshelf 1282 (Proprietary) Limited (the "Project Company"), an Independent Power Producer (IPP) is proposing the construction of a coal-fired power station (the "Project") on a site near Lephalale in the Limpopo Province. This project was previously presented by Exxaro Resources, who subsequently selected the Project Company as a preferred IPP for the development of the power station.

The proposed coal-fired power station will have a generating capacity of up to 1 200 MW which is intended to provide electricity for integration into the national grid. The purpose of the proposed IPP Thabametsi Power Station[1] is to provide baseload power to the national electricity grid.

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 prior to the commencement of construction of the project. This Draft 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
» **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] Previously referred to as the IPP Waterberg Power Station.

1.1. Project Overview

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. The Integrated Resource Plan (IRP) 2010 developed by the Department of Energy 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 order to meet this required generation capacity, the IRP includes a mix of generation technologies, including 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.

In response to the need for additional electricity supply to the national grid, and the goal of Government to procure electricity from Independent Power Producers (IPPs), as detailed in the IRP 2010, Newshelf 1282 (Proprietary) Limited (the "Project Company") is proposing the construction of a coal-fired power station on a site near Lephalale in the Limpopo Province. The power station would have a capacity of up to 1 200 MW (to be developed in two phases of 600MW each). This capacity is constrained by the available water, as well as constraints associated with grid integration.

The proposed site is located approximately 26km north-west of Lephalale within the Lephalale Local Municipality, in the Waterberg District Council of the Limpopo Province. The site is located within the Waterberg Coal Fields, in close proximity to a proven coal resource (to be mined by the Thabametsi Coal Mine to be developed by Exxaro Resources). Various alternative sites for the construction of the proposed Power Station were considered in the scoping phase of the project, i.e.: Onbelyk 257 LQ, Gelykebult 455 LQ, Gelykebult 450 LQ, Eendragtpan 451 LQ, and Vooruit 449 LQ (Refer to **Figure 1.1**). The Farm Onbelyk 257 is the technically preferred site for the power station and was determined to be the environmentally preferred site from the studies undertaken in the Scoping Phase of the EIA process, and is further assessed in this EIA Report. A draft layout of the infrastructure for the power station is provided in Appendix A.

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. This ensures a plant with relatively low emissions. In addition, the power station will utilise dry cooling technology and dry ashing due to water availability constraints.

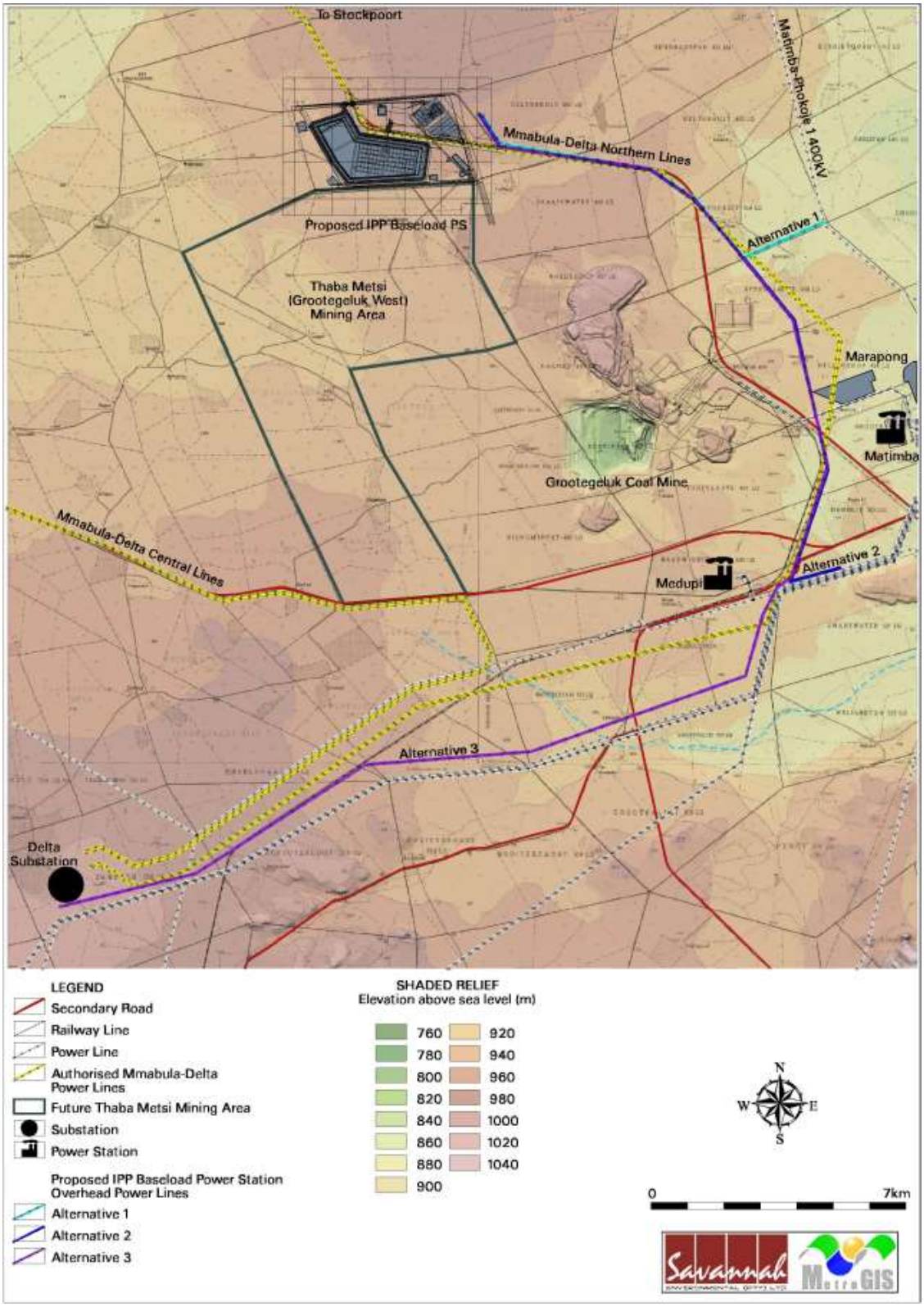


Figure 1.1: Locality map showing the proposed area for the establishment of the Thabametsi coal-fired power station and associated power lines on a site near Lephalale, Limpopo Province

The main infrastructure that is required for the IPP Thabametsi coal-fired power station includes *(specifications will be determined based on the technology selected):*

» Access roads.
» Coal storage areas and bunkers. Coal is to be provided to the power station from the new Thabametsi mine proposed to be established to the south-east of the site (refer to Figure 1.1).
» Pipeline for water supply. Water is to be supplied from the allocation to Exxaro Coal from the Mokolo-Crocodile Water Augmentation Project (MCWAP). It is also necessary to consider water supply from the Crocodile River for further expansion.
» Coal loading and offloading areas, as well as conveyor belts.
» Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room).
» Ash dumps.
» Wastewater treatment facilities (including Raw-Water Storage Dams, wastewater treatment works, purification works and reservoirs).
» A High Voltage Yard.
» Overhead power lines to connect into the Eskom grid. The power generated is planned to evacuate into the electricity grid at a point to be determined in consultation with Eskom. Three alternative power line routes have been proposed for consideration in the EIA process (refer to Chapter 3 for more details in this regard).
» Office and maintenance area/s.

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

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

Savannah Environmental was contracted by the Project Company 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 to the Project Company. 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 8 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 Independent Power Producers such as the Project Company.

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 Ravisha Ajodhapersadh and Gabriele Wood from Savannah Environmental. Curricula vitae for the Savannah Environmental project team consultants are included in Appendix A. 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. The curricula vitae for the EIA specialist consultants are also included in Appendix B.

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**.

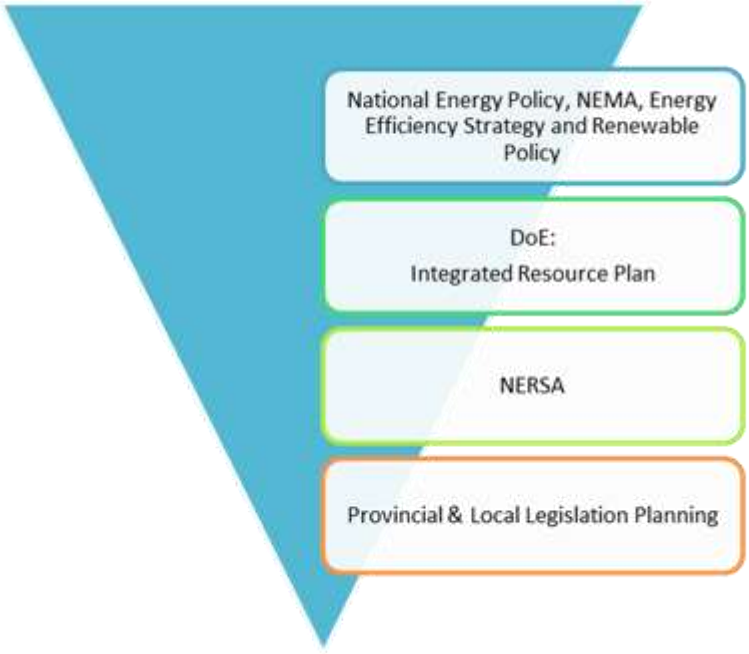


Figure 2.1: Hierarchy of electricity policy and planning documents

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.

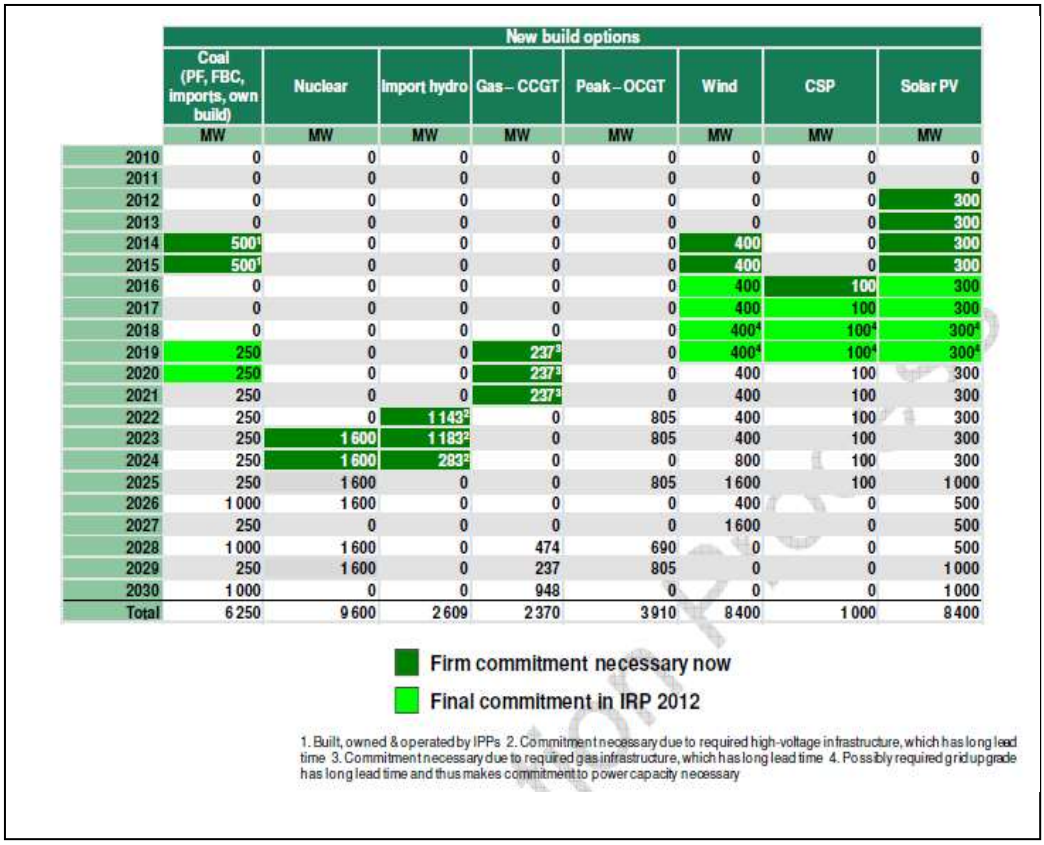
In order to meet these objectives and the developmental and socio-economic objectives in South Africa, the country needs to optimally use the available energy resources. The South African Government is required to address what can be done to meet these electricity needs both in the short- and long-term. 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 Department of Energy has now completed an IRP 2010 Update (which was available for comments until 7 February 2014). It is expected that the final IRP 2010 Update will be submitted to Cabinet for final approval in March 2014, and subsequently promulgated and published in the Government Gazette.

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 projects under the Renewable Energy IPP procurement (REIPPP) programme.

2.2 Provincial Policy and Planning Context

2.2.1. Limpopo Employment, Growth and Development Plan (LEGDP) (2009-2014)

The Limpopo Employment Growth and Development Plan aims to solve the problem areas of growth, decent jobs and poverty reduction within a broad economic wide framework. This plan synthesises findings from recent analysis of different sectors and features of the Limpopo political economy. While its focus is broad, it does not try to present all the components of a comprehensive growth plan – in some areas, it points instead to issues where further investigation is called for. The main objective of this plan is to contribute to the economic debate in the province and in the country by highlighting policy imperatives that should be addressed to promote growth and employment in a complex international and domestic economic environment. The proposed project will contribute to growth and development of the study area by expanding the economic base and creating employment opportunities.

2.3 Local Policy and Planning Context

2.3.1. Waterberg District Spatial Development Framework (2009)

The overarching aim of the Waterberg District Spatial Development Framework (SDF) is to provide a spatial framework within which the sustainable development of the district and its specific resources can be carried out. The Framework is intended to be broad-scaled and centred on principles and issues significant to the district as a whole. The principle focus of the SDF is on spatial elements. The Waterberg SDF consists of 6 main objectives namely:

» restructure spatially inefficient settlements;
» promote the sustainable use of the land resources in the country;
» channel resources to area of greatest need and development potential, thereby redressing the inequitable historical treatment of marginalised areas;

» take into account the fiscal, institutional and administrative capacities of role players, the needs of communities and the environment;
» stimulate economic development opportunities in rural and urban areas; and
» support an equitable protection of rights to and in land.

The proposed project will contribute towards the stimulation of economic development opportunities, specifically within the energy sector.

2.3.2. Waterberg District Municipality Integrated Development Plan (2013/2014)

The integrated planning approach for the Waterberg District is documented in the IDP which focuses on: local economic development and spatial rational; municipal transformation and organisational development; good governance and public participation; basic service delivery and infrastructure; municipal financial viability and financial management. The vision of the Municipality is "to be the energy hub and eco-tourism destination in Southern Africa." The municipality's mission is "to invest in a constituency of talented human capital who are motivated and innovative to build a sustainable economy in the field of energy, minerals and eco-tourism for the benefit of all our communities." The proposed project will contribute in assisting the WDM in its aim for building a sustainable economy in the field of energy.

2.3.3. Waterberg District Municipality Air Quality Management Plan (AQMP), 2009

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 its 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. The construction of the new power station in Lephalale requires that the industries should comply with air quality standards. In the WDM, the air quality hot spots are Lephalale, Mogalakwena and Thabazimbi as a result of the presence of industry, mines and power stations. The AQMP recommends emission reduction interventions for the District. Of specific relevance to the IPP Thabametsi Power Station are those measures applicable to power generation.

2.3.4. Waterberg District Environmental Management Framework (EMF) (2010)

The WDM, together with the Department of Environmental Affairs (DEA), developed an Environmental Management Framework (EMF) for the WDM area. The purpose of the EMF 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. The specific objectives of the EMF include:

» Encourage sustainable development;
» establish development priorities;
» identify strategic guidance and development management proposals;
» identify the status quo, development pressures and trends in the area;
» determine opportunities and constraints;
» identify geographical areas in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
» specify additional activities within identified geographical areas that will require EIA based on the environmental attributes of such areas;
» specify currently listed activities that will be excluded from EIA within certain identified geographical areas based on the environmental attributes of such areas; and
» develop a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

The EMF defines Environmental Management Zones for the Waterberg on the basis of the status quo of the area as well as from inputs obtained through the EMF development process. The proposed project development site falls within Zone 4: Mining focus areas (refer to Figure 2.3). This zone represents areas where significant mineral resources (in this instance coal) of strategic national importance occur within largely natural environments. The proposed power station would be viewed as a preferred development within this Zone as it is directly associated with mining (i.e. the Thabametsi Mine), and does not restrict or constrain potential mineral exploitation.

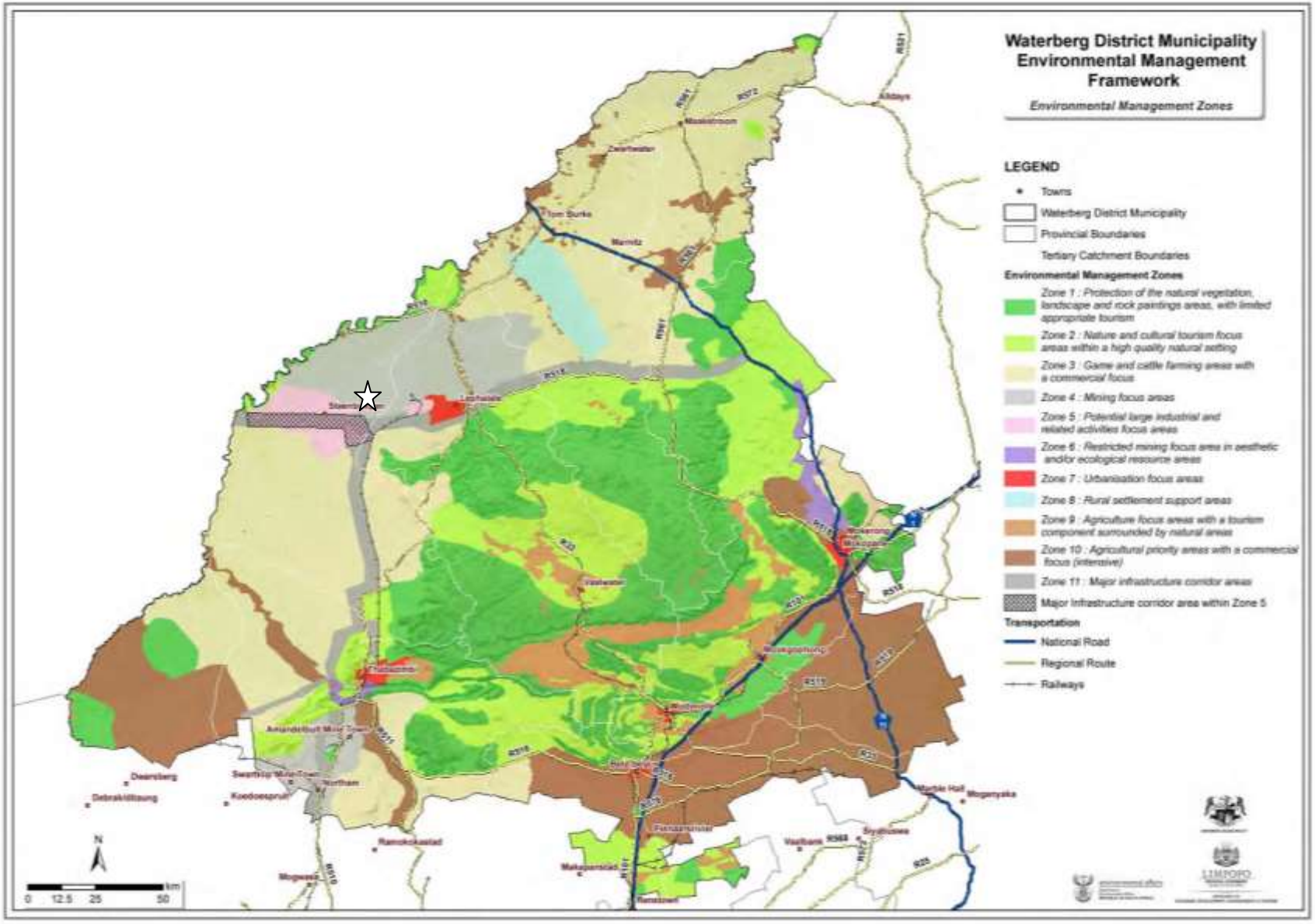


Figure 2.3: WDM EMF: Environmental Management Zones showing the location of the study area (white star)

2.3.5. Lephalale Local Municipality IDP (2013 – 2016)

The proposed project site falls within Spatial Development Area 3 (mixed non-residential land-use driven by mining and energy) as defined in the Spatial Development Framework and within the mining zone (focus area 3) as defined in the IDP. The proposed project is therefore in line with the strategic planning of the municipality.

The IDP acknowledges the coal reserves and potential for establishment of additional mines and power stations in the area as part of the municipality's competitive advantage. The IDP specifically refers to the proposed new coal mine being proposed by Exxaro Coal (i.e. Thabametsi), and also acknowledges the plans to develop a 1200MW IPP power station linked to this mine (i.e. the IPP Thabametsi Power Station). These developments are recognised as being part of the economic development potential of Lephalale and will contribute towards benefits to the local community. Further, the creation of an enabling environment where the electricity sector can become a hub within the provincial and national economy is noted as a contributing factor towards the realisation of development opportunities within the municipality.

SCOPE OF THE PROPOSED PROJECT CHAPTER 3

The IPP Waterberg 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 Coal-Fired Power Station

Approximately 90% (NDP, 2011) of South African electricity comes from coal-fired power stations, with Eskom being the dominant electricity producing company generating 95% of all electricity in South Africa (SA Yearbook 2009/2010). 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. Although the electricity demand shows a slight negative trend over the recent past, the maximum demand, together with the greater need for maintenance of existing power plants, has put the available power supply under pressure. In spite of capacity coming on line in the near future (as a result of the commissioning of Medupi Power Station near Lephalale, and a number of renewable energy projects across the country), the electricity demand within the country is still higher than the available capacity.

The Integrated Resource Plan (IRP) 2010 developed by the Department of Energy 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 order to meet this required generation capacity, the IRP includes a mix of generation technologies, including 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. Between 2010 and 2020, the IRP (2010) provides that 14.7% of the generation capacities of the envisioned coal-powered power stations to be developed are to be added by Independent Power Producers (IPPs).

The need to develop IPP coal-fired power stations has been identified by the Project Company in order to meet the requirements of the IRP 2010. In addition, the proposed project is considered desirable in terms of the planning and policy aims and needs of the Limpopo Province, Waterberg District Municipality and Lephalale Local Municipality, as discussed in the previous chapter of this report.

The proposed site is considered to be technically feasible by the Project Company due to the confirmed availability of coal and water for the operation of the power station.

3.2. Description of the Proposed Project

The project involves the construction of a coal-fired power station which will provide baseload power supply[2] to the electricity grid. The power station would have a capacity of up to 1 200 MW (to be developed in two phases of 600MW each). This capacity is constrained by the available water, as well as constraints associated with grid integration. Coal is to be supplied from the Thabametsi coal mine to be developed to the south of the site.

The project involves the construction of a coal-fired power station and associated infrastructure. Table 2.1 below provides details of the proposed project, including the main infrastructure and services. Refer also to the preliminary layout included in Appendix A.

Table 2.1: Details of the proposed project

Component	Description/ Dimensions
Location of the site	Farm Onbelyk 257 LQ located approximately 26km north-west of Lephalale
Municipal Jurisdiction	The property is located within the Lephalale Local Municipality which falls within the Waterberg District Municipality.
Electricity Generating capacity	1200MW, to be developed in two phases of 600 MW each
Proposed technology	» Circulating Fluidised Bed (CFB) coal-fired power station (baseload power supply) » Dry cooled » The facility will be developed as a zero liquid effluent discharge (ZLED) plant.
Extent of the proposed development footprint (including Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room), Office and maintenance area/s and ash dump area	» Power Plant - 50ha » Ash Dump – 500ha (extending over a 40-year period) » Strategic Coal Stockpile – 100ha (providing for a stockpile for 30 days) » A Raw-Water Dam - 2ha
Extent of broader site	1072ha

[2] Baseload electricity generating capacity" refers to power station technology designed specifically to generate electricity continuously for all hours of the day and night

Component	Description/ Dimensions
Stack height	150m, 185m or 220m
Coal storage areas and bunkers, Coal loading and offloading areas, as well as conveyor belts with transfer house (battery-limit situated at boundary with Thabametsi Mine)	» Coal is to be provided to the power station from the Thabametsi coal mine proposed to be established to the south-east of the site. » To be supplied at a rate of 1000 t/h » Coal will be transported to the coal storage area via overland conveyors. The routing of these falls within the mine area and is considered in the EIA for the Thabametsi mine.
Strategic Coal Stockyard	sized for a ~30-days capacity of ~700,000 tonnes
Sorbent (limestone granular)	» 64 T/hr for 1200 MW capacity » To be obtained from sources in the Northern Cape[3]
Ash dumps and associated drainage channels and pollution control dams	» 660-t/h of ash and spent sorbent to be disposed of to the ash dump » 500ha in extent » Height: up to 50m » Provides storage for a volume of approximately 200 million cubic meters of ash » Ash to be transported from power station to ash dump via overland conveyors » Three pollution control dams to be associated with ash dump – capacity proposed to be 75 000m^3, 54 000m^3 and 33 000 m^3
Site access	The D1665 / D2001 Road is expected to be the main access to the site
Grid connection	» On-site substation (HV Yard) associated with the power station » 400kV power line connecting the power station to the national grid at a point to be confirmed in consultation with Eskom. 3 alternatives under investigation (refer to Ch 3) » Three 400kV power lines with a total servitude width of 165m (i.e. 55m per power line) are required. » Height of towers – maximum height of 35m
Services required	» Refuse material disposal - all refuse material generated from the proposed development will be collected by a contractor to be disposed of at a licensed waste disposal site off site. This service will be arranged with the municipality when required. » 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

[3] Sources of sorbent to be confirmed through further investigations

Component	Description/ Dimensions
	wastewater treatment facility will be operated on the site. » Water– 1.5-million m^3/a is required for 1200MW. Water for Phase 1 is to be supplied from the allocation to Exxaro Coal from the Mokolo-Crocodile Water Augmentation Project (MCWAP) Phase 1. This water supply has been confirmed. Water for subsequent phases proposed to be obtained from water supply from the Crocodile River (MCWAP2). » Electricity: the electricity requirements for this facility are being considered under the EIA for the Thabametsi mine. This is considered as shared infrastructure and therefore addressed in the mine EIA
Pipeline for water supply	» Length:~18-km in length » Two alternative routes are being considered for the water supply pipeline. These pipeline routes are being considered within the EIA process for the Thabametsi coal mine (refer to Appendix A for proposed pipeline route as considered within this process). » Tie-in, booster pump-station and pipe-line for water supply, from current tie-in point at Matimba Power Station to Raw Water Storage Reservoir on site
Raw-Water Storage Reservoir and Pump-station	» Capacity: 120 000m^3 » Reservoir wall height: 1-2 m (to be confirmed in final design)
Water treatment plant	» Daily treatment capacity: 4800 m^3/day
Wastewater treatment plant	» Daily throughput capacity: 6000 m^3/day

The main components of a coal-fired power station are shown on the preliminary facility layout contained within Appendix A.

3.2.1. Water Use

The project will source its water from the Mokolo Crocodile Water Augmentation Project (MCWAP) phase 2 which is scheduled for completion by 2019/20 (refer to Appendix R). For the construction and early production of the first phase (600MW) the water will be sourced from Exxaro Resources who has, amongst others, an allocation for MCWAP phase 1. It is the intent to share infrastructure between the Thabametsi mine and the power stations such as the pipeline in order to reduce the impact on the environment.

The power plant will use water of different qualities in 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.
- Recycled water from other processes is proposed to be used for ash hydration, ash handling, and coal dust suppression.
- 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.
- Plant wastewater will be treated as required for utilization in the bottom ash system, ash hydration and landfill process, and the coal dust suppression systems.

In terms of the National Water Act (Act No 36 of 1989), a water use license will be required to be obtained for the various water uses as described above. In terms of the application for water supply from MCWAP2, the date for submission of applications is to be confirmed by the DWA and TCTA (refer to Appendix R). As the Water Use license application process requires that a project submits a consolidated application (i.e. for all water uses), the application for all water uses will only be submitted once the date for submission has been confirmed.

In terms of water uses which would be relevant for the project, the following is applicable:

» 21 a) taking water from a water resource:
» 21 b) storing water
» 21 c) Impeding and diverting the flow of a watercourse
» 21 e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1) (i.e. using wastewater for dust suppression)
» 21 g) Disposing of waste in a manner which may detrimentally impact on a water resource
» 21 h) Disposing in any manner of water which contains waste from or which has been heated in any industrial or power generation process
» 21 i) Altering the bed, banks. course or characteristics of a watercourse

3.2.2. Waste Management and Treatment

Waste treatment for the power station includes the following:

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

Table 3.1 provides an estimate of the quantities of waste produced by the IPP Thabametsi Power Station.

Table 3.1: Estimate of the quantities of waste produced by the IPP Thabametsi Power Station

Hazardous waste	Non-hazardous waste	Total waste handled (tonnes per day)
Ash + Sorbent		16,000
Waste Water		6,000
Sewage		50
	Polluted Water (Rainwater Run-off)	To be determined
	Compactable General Waste	16
	Un-Compactable General Waste	4
Oil-contaminated Run-off / Water		0.2
Spent Lubricants & Chemical Fills		0.2
Spent Consumable / Fills Materials		0.2
Spent Flue-Gas Filter Bags		To be determined

The figure below provides an overview of the waste generation and treatment process at the power plant.

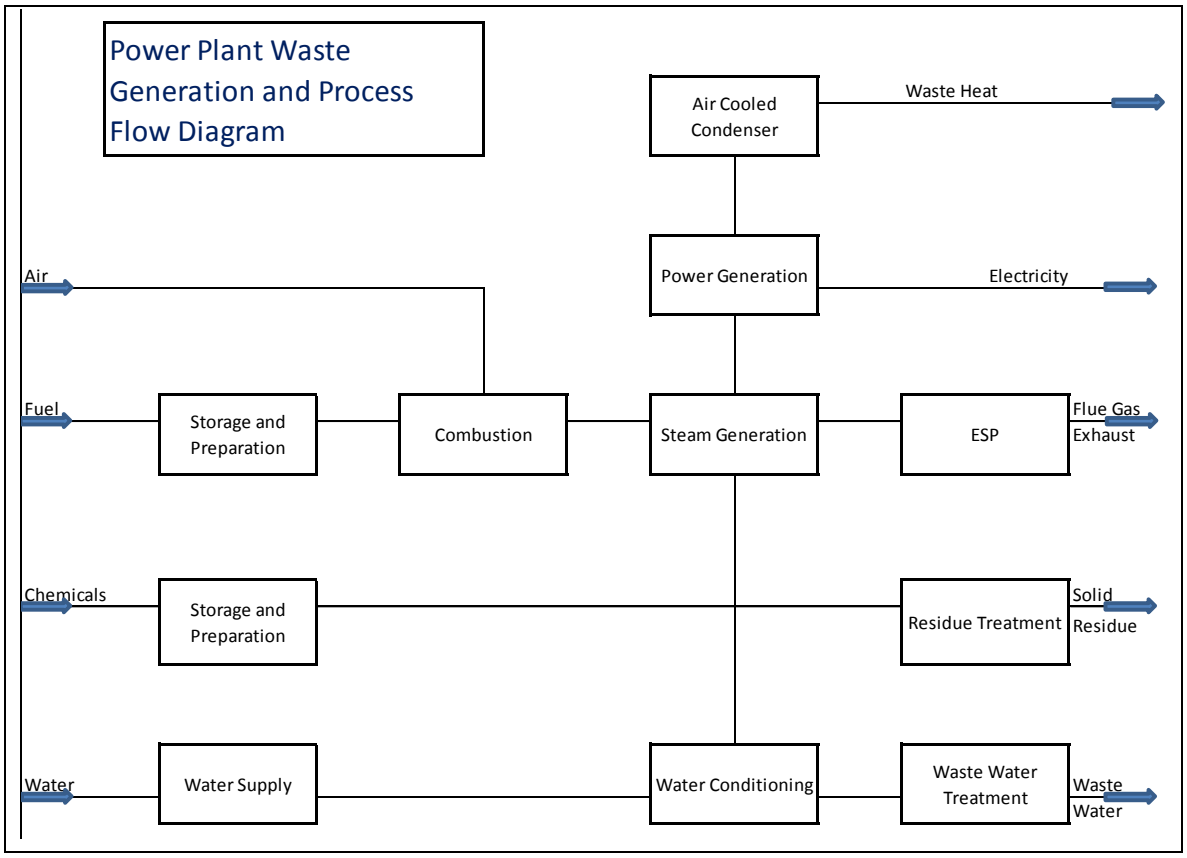


Figure 3.1: Power plant waste generation and process flow diagram

Liquid Waste Treatment

» ***Sewage Treatment***

All sewage will be treated in wastewater treatment works. It is proposed that a central packaged Sewage Treatment Plant (STP) shall be provided for the control room, admin building and workshop area, and small package units will be installed at distant locations such as the ash handling plant.

The wastewater treatment system will be designed to meet national legislation requirements. The following is proposed in terms of the process (refer to Figure 3.2):

* The influent wastewater will enter the wastewater treatment plant by passing through a bar screen for gross solids removal. This step provides for the mechanical reduction of solids prior to aeration.
* A flow equalization chamber shall be sized to handle the daily design flow profile. The flow equalization chamber allows for a constant flow through the plant by equalizing flow surges that may be incurred during peak flow times.

* Once the wastewater has entered the aeration chamber, the untreated flow is mixed with an active biomass in a rolling action that takes place in the length and width of the chamber in a slow forward progression. The aeration chamber will be of sufficient capacity to provide a minimum of 24 hours retention of the average daily flow, and/or maximum loading of BOD5 per m^3 of aeration tank volume as per international norms. This rolling mixing action is the result of air originating from air diffusers located along one side of the bottom of the tank. This ensures that adequate mixing is maintained in the tank. The chambers are filleted on each side along the bottom to assure and enhance the rolling motion of the water and to eliminate any "dead zones" in the tank. The oxygen transfer achieved with the diffused air passing through the wastewater coupled with the rolling action provides a sufficient oxygen supply allowing microorganisms to oxidize treatable wastes in to carbon dioxide, water, and stable sludge.
* After aeration, the wastewater flows to the clarifier that typically has a hopper bottom configuration. The wastewater clarifiers are sized to provide the required retention time based on an average 24 hour design flow. During the settling period, solids settle on the bottom of the clarifier. Airlift pumps with adjustable pumping capabilities are used to return these solids, as activated sludge, to the aeration chamber to maintain the maximum efficiency of the biological process. When necessary, excess sludge is wasted to an aerated sludge digestion tank for additional treatment and reduction. A skimmer airlift pump is used to return floatable solids and scum to the aeration chamber for further processing.
* The treated water flows from the clarifier to a disinfection chamber for treatment via chlorination or ultra-violet (UV) disinfection prior to discharge to complete the treatment process. Tertiary filters may also be used where a higher quality of effluent is required.

A control panel with the capability to operate the system when required as determined by the variation in the daily flow rate shall be installed. Properly sized circuit breakers and fuses will protect all electrical equipment and circuitry.

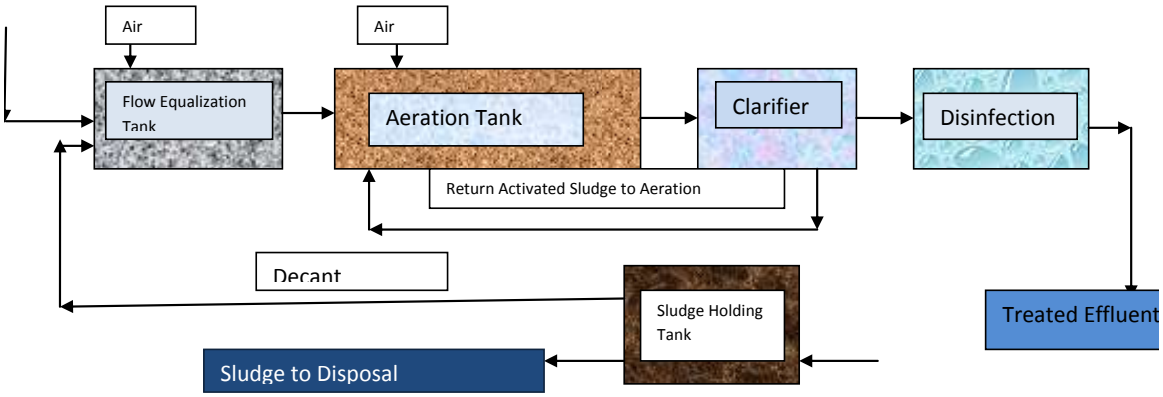


Figure 3.2: Efficient multi-step wastewater treatment process

Treated liquid effluent from wastewater treatment will be recycled within the power station precinct. If tests indicate that it is suitable to do so, waste sludge will be used as a soil conditioner. 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 authorised external contractors

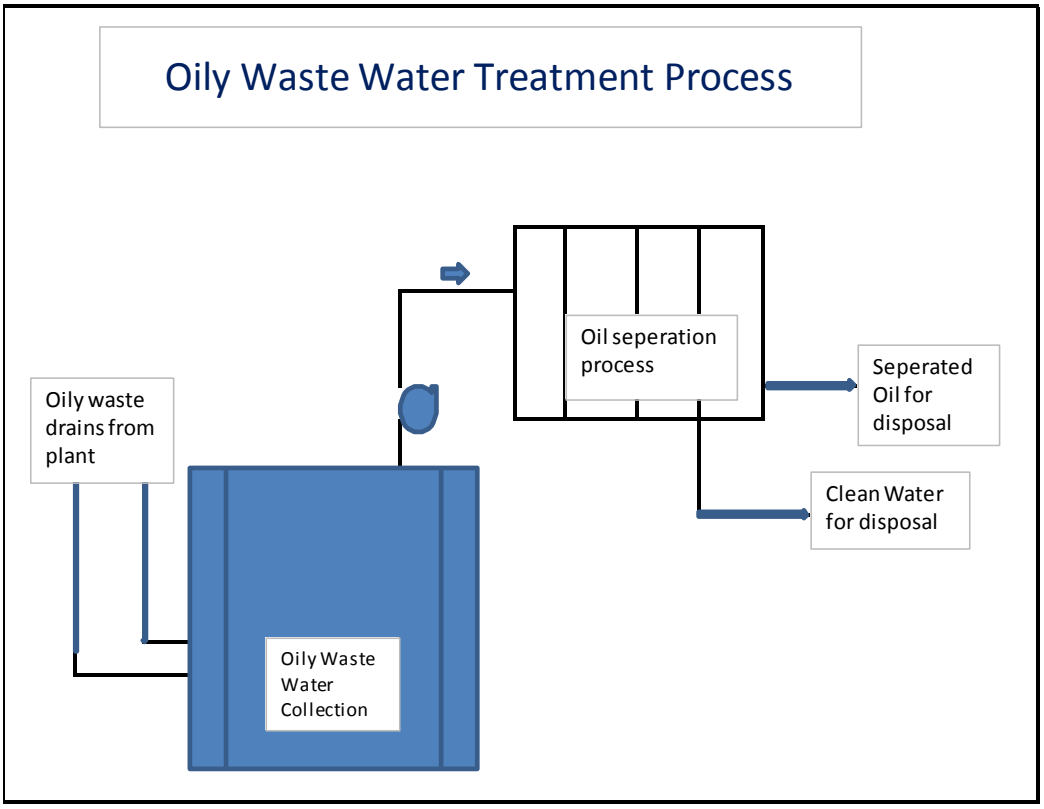


Figure 3.3: Oily wastewater treatment and disposal

» ***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.

» ***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 to the temporary storage 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 dump is sized to accommodate the estimated bottom ash and fly ash from all units for 40 years assuming a conservative availability and capacity factor. The ash dump provides storage for a volume of approximately 200

million cubic meters of ash and would have a footprint of approximately 500ha and approximately 50m high. The ash dump 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).

A sufficiently high berm will be constructed around the landfill, and a suitable drainage channel will be constructed inside the berm for surface runoff water control. A conveyor system will be constructed from the plant site for transporting bottom ash to the ash dump. Conditioned ash will be transported to the disposal area by conveyor, and suitable ash handling equipment like stacker(s) will be used to position, spread, level and contour the ash mound as necessary. The ash dump will have a membrane liner and a run-off collection system. Run-off ponds of suitable size will be constructed around the dump.

The following mitigation measures will apply for the ash dump as it is developed through the course of the project lifespan:

* The ash dump will be developed in stages. The initial ash dump area is to be suitably lined. Thereafter, each area will be lined in accordance with legislative requirements.
* Stormwater canals are to be constructed along the entire perimeter of the ash dump.
* The perimeter stormwater canals will be designed to collect dirty water runoff from the dump surface and will discharge to pollution control dams (three 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 dump for dust suppression

3.3. 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 (refer to Figure 3.4):

1. **Fuel:** Coal will be conveyed to the power plant from the coal mine via overland conveyor and stored at the coal stockyard. When required by the boiler, a stacker reclaimer serves coal onto a conveyor system which transports the coal to the day silos next to the boiler. The coal is then drawn from the day silos directly into the furnace for combustion.

2. **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.

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

4. **Cooling:** The proposed power plant will be designed with dry cooling technology in order to significantly reduce water consumption.

5. **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.

6. **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.

7. **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.

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

9. **Transmission:** The electricity is then fed into a high voltage yard and then fed into the power line which feeds into the electricity grid.

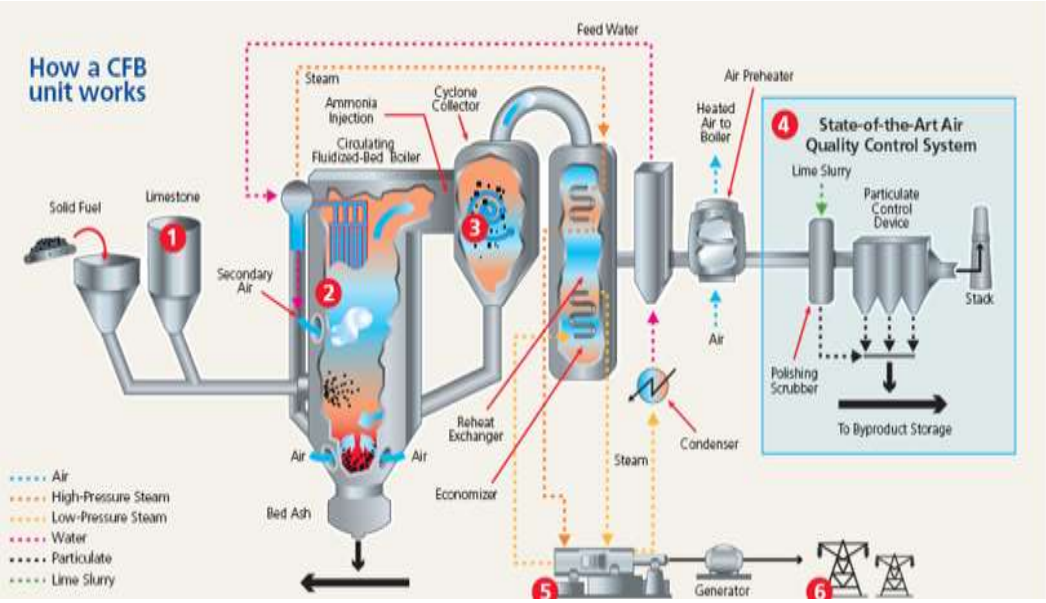


Figure 3.4: Example of CFB technology in the generation of electricity

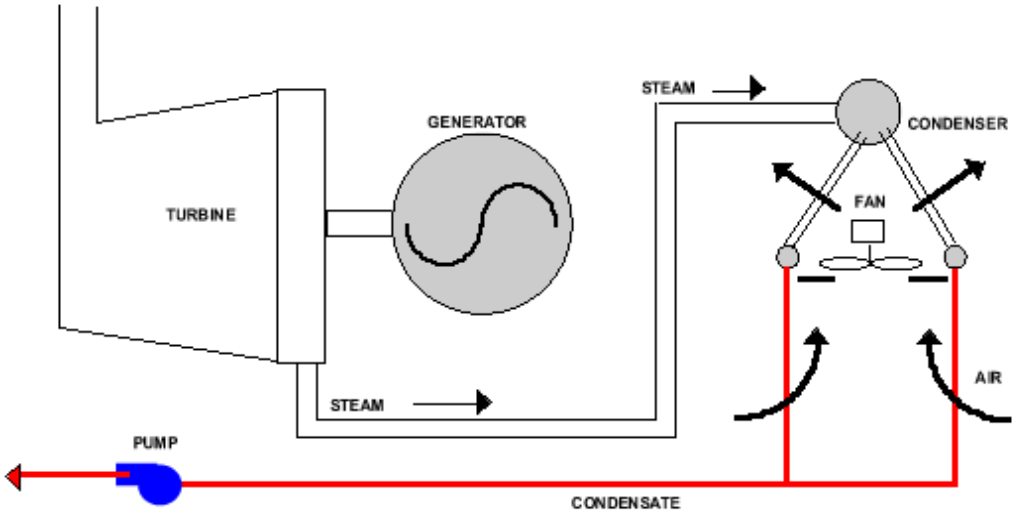


Figure 3.5: Direct dry cooling system[4]

3.4. Life-cycle Phases of the proposed Power Station

3.4.1. Construction of a Coal-Fired Power Station

Construction of the proposed coal-fired power station is expected take between 48 - 54 months. The construction activity involves the following[5]:

» Prior to initiating construction, a number of surveys will be required including, but not limited to, geotechnical survey, transportation survey, site survey and confirmation of the power station footprint, survey of substation site, pipeline and survey of power line servitude;
» Access roads will need to be established to the site;
» 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 involves concrete works for structures such as foundation, the production unit (which houses the turbines, generator and so forth), stacks, cooling towers (if applicable), substation and associated infrastructure;
» Mechanical and electrical work will then follow;
» Ancillary infrastructure such as office buildings, pipeline (to transfer water from the allocation to Exxaro Coal from the Mokolo-Crocodile Water Augmentation Project (MCWAP)), conveyor belt, and a power line linking to the electricity transmission grid will be established; and

[4] http://www.emt-india.net/process/power_plants/condenser&cooling_sys.htm
[5]http://www.eskom.co.za/live/monster.php?URL=%2Fcontent%2FCO_0003BuildCoalPSRev4.pdf&Src=Item+28).

» As construction is completed in an area, and as all construction equipment is removed from the site, the site will be rehabilitated where practical and reasonable.

3.4.2. Operation of a Coal-Fired Power Station

Prior to the operation of the power station, testing and trails will need to be undertaken. The proposed facility will create 239 permanent employment positions that will be retained for 40 years. It is anticipated that there will be full time security, maintenance and control room staff required at the site. In order to operate a coal-fired power station, resources are required (input), and processes and outputs occur from the electricity generation process. This concept is outlined in **Figure 3.5.**

Figure 3.5: Resources (input), processes and outputs (waste) for a coal-fired power station

Figure 3.5 illustrates that in order to operate a coal-fired power station, natural resources such as coal and water will be required. For combustion coal and 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 by-products. The power station will operate for 24 hours a day and 7 days a week.

3.4.3. Decommissioning of a Coal-Fired Power Station

The lifespan of the proposed coal-fired power station is more than 30 years. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility discussed in this EIA would comprise the disassembly and disposal of the infrastructure. Decommissioning activities will involve disassembly of the production units and ancillary infrastructure, demolishing of buildings, removal of hazardous waste and rehabilitation of the ash dumps and site.

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 fundamentally different alternatives. 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. The Project Company is therefore proposing the development of a coal-fired power station and have not considered any other power generation options for this project.

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. Selection of the Waterberg Region for the development of the proposed project

As the availability of the coal resource is critical to the development of such a project, the location of the power station is constrained to a large degree by the location of this resource. Over 50% of South Africa's remaining coal reserves lie in the Waterberg coalfields, a 3 500km^2 expanse of Limpopo that stretches into Botswana and hosts almost 76 billion tonnes of in-situ inferred resources in 11 coal-bearing zones. In order to exploit this resource, a number of new coal mines are proposed in the Waterberg area. Of particular relevance to the proposed power station is the new coal mine, Thabametsi Coal Mine, to be developed by Exxaro Resources. This mine will provide the required coal resource to the power station for the operational life of the power station. These factors dictated the selection of the Waterberg region for the development of the proposed power station.

4.1.2. Selection of the proposed site for development

An environmental screening study was undertaken by Savannah Environmental in 2011 on behalf of Exxaro Resources (the original proponent for the project[6]) to consider the constraints and benefits of the development of the power station within two areas (the northern site and the southern site) identified for the project (refer to Figure 4.1). The following issues were considered within this screening study:

» Water availability and point of connection
» Point of connection to the electricity transmission grid
» Access to the site
» Conveyor systems between the Thabametsi mine and the power station

It was concluded from this study that both sites had various opportunities and constraints. Both sites were considered similar in terms of grid connection, access, water supply and coal supply. A significant constraint associated with the southern site was the fact that the land is privately owned (whereas the northern site is owned by Exxaro Resources), and space for development could be a constraining factor due to the space available for development on the site taking into consideration all the planned and authorised infrastructure in the area (such as the 16 new power lines between Delta Substation and Medupi Power Station).

[6] The Project Company was selected by Exxaro Resources as a preferred IPP for the development and operation of this power station following a bidding process.

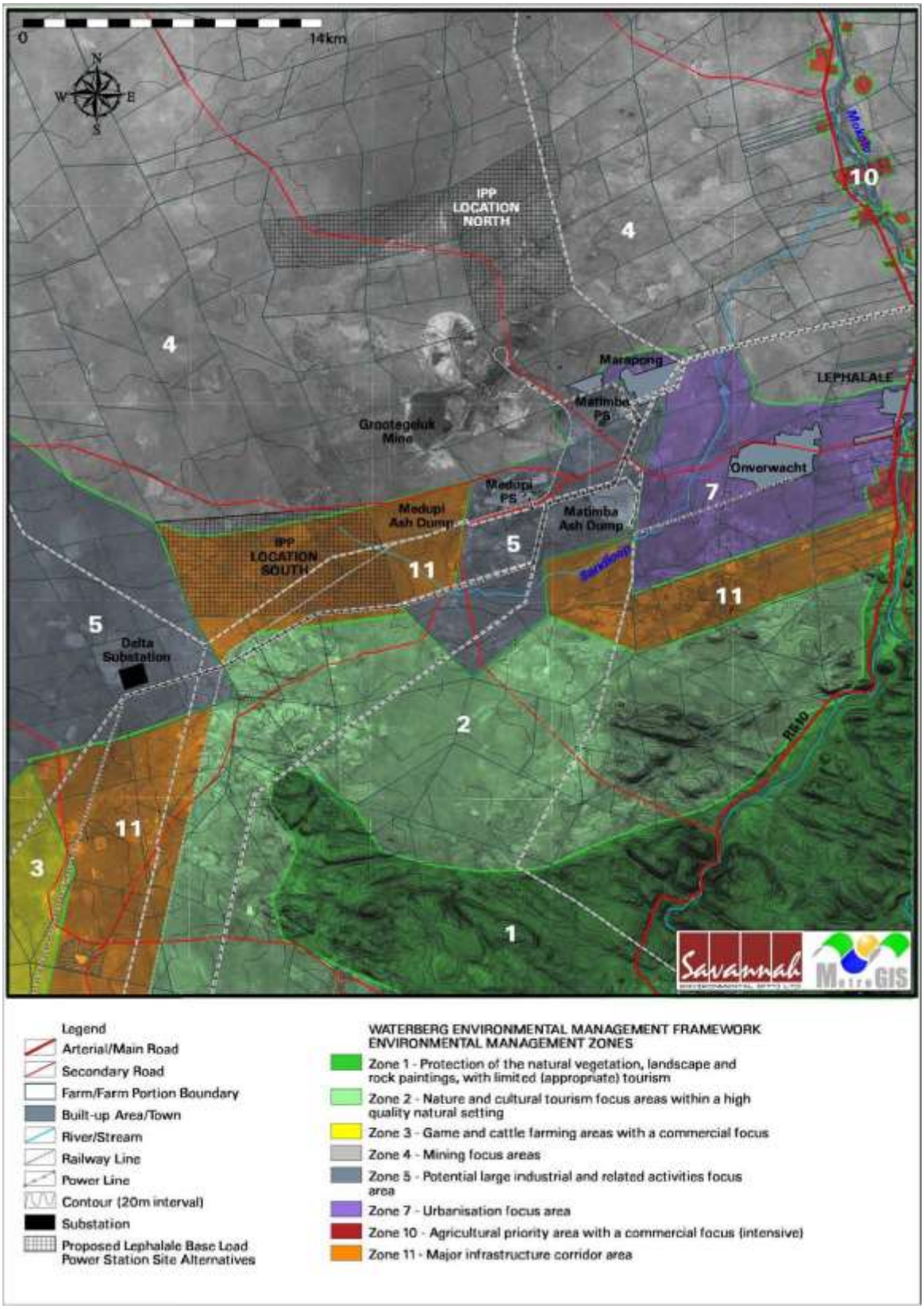


Figure 4.1: Map indicating the two areas considered for the location of the IPP Thabametsi Power Station and the Environmental Management Zones identified within the Waterberg District Municipality's EMF

In determining the preferred site for development, Exxaro Resources considered technical and financial aspects as well as the environmental constraints and opportunities highlighted for each site within the screening study. The northern site was selected as the technically preferred site for further investigation largely on the basis of the fact that the land is owned by Exxaro Resources and the area available for development would be sufficient for the proposed project.

This "northern site" consisted of five feasible site alternatives (situated on five different farms) identified by for the establishment of the proposed power station, i.e.: Onbelyk 257 LQ, Gelykebult 455 LQ, Gelykebult 450 LQ, Eendragtpan 451 LQ, and Vooruit 449 LQ. The surface rights of all the farms belong to Exxaro Coal. Of the five farms, three (Gelykebult 450, Eengragtpan 451 and Vooruit 449) currently operate as commercial hunting and game farms. The technically preferred site for the IPP Waterberg Power Station is on the Farm Onbelyk 257 LQ which is shown in Figure 4.2 (which also shows the alternative sites). Through the Scoping Study undertaken for the project, the Farm Onbelyk was confirmed as the preferred site from an environmental perspective due to the reduced environmental impacts associated with development on this site. This site has therefore been assessed in detail through this EIA investigation.

4.2. Design or Layout Alternatives

A preliminary layout for the power station and associated infrastructure on the Farm Onbelyk has been proposed by the developer for investigation (refer to Appendix A). No feasible alternative layouts have been identified. However, should any environmentally sensitive areas which should be avoided be identified through the EIA process, these areas will be avoided as far as possible in developing the final layout of the facility.

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.

Figure 4.2: The technically preferred site (i.e. Farm Onbelyk 257 LQ (red block)) as well as alternatives sites for the IPP Waterberg Power Station

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.[7]

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)[8].

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 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_x emissions. The solids from the filter are re-circulated into the bed. Limestone can be added to capture sulphur and prevent its release to the atmosphere as sulphur dioxide.

Through the technical feasibility studies undertaken for the project, **FBC technology has been selected as the preferred technology** for implementation at the power station. This is the alternative assessed within this EIA.

[7] http://en.citizendium.org/wiki/Conventional_coal-fired_power_plant

[8] (http://en.wikipedia.org/wiki/Fluidized_bed_combustion).

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 (illustrated in **Figure 4.3**), the steam from the turbines goes to dry-cooling element or a heat exchanger. Fans are used to blow air over the condenser causing water vapour to change 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.

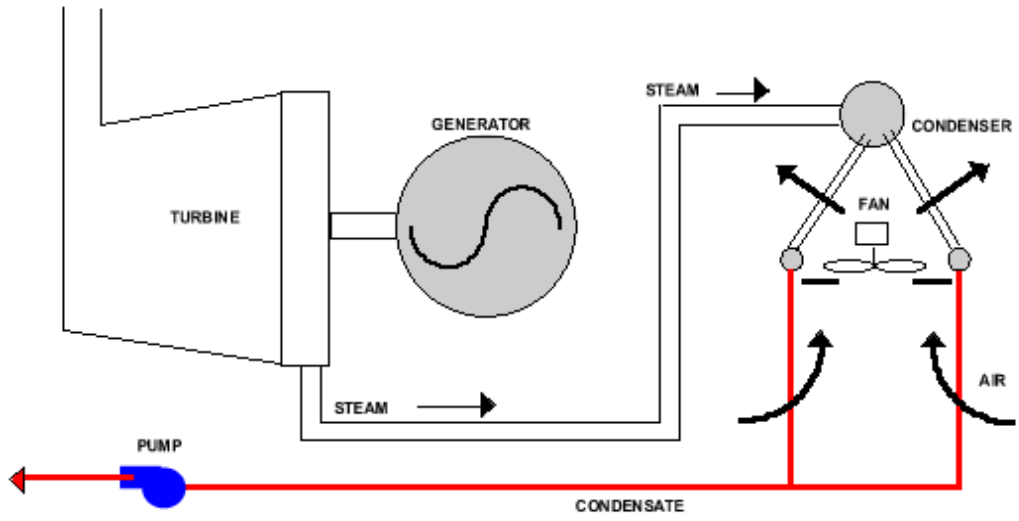


Figure 4.3: Direct dry cooling system[9]

b) Indirect Dry cooling

This method is illustrated in Figure 4.4. A cooling tower and cooling water (from a water resource) is required. Warm water from the condensers is pumped to

[9] http://www.emt-india.net/process/power_plants/condenser&cooling_sys.htm

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 Witbank in the Mpumalanga Province. Associated issues include additional visual impacts associated with the large cooling towers required.

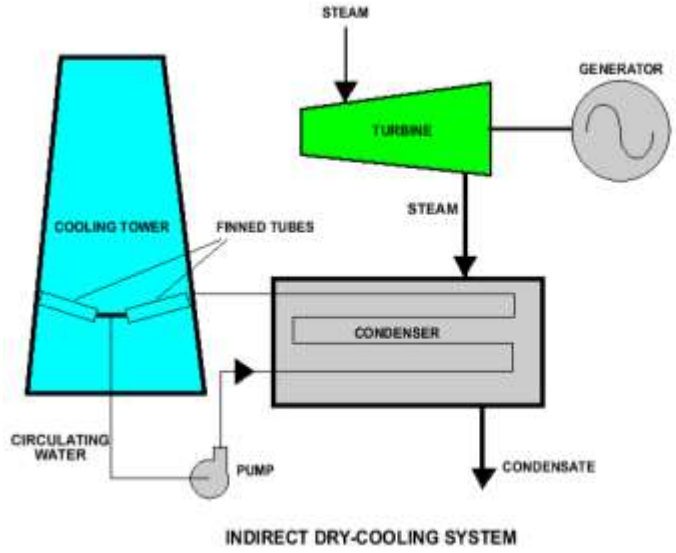


Figure 4.4: Indirect dry-cooling system [10]

Through the technical feasibility studies undertaken for the project, **direct dry technology has been selected as the preferred technology** for implementation at the power station. This is the alternative assessed within this EIA.

4.3.3. Operational Alternatives – Pollution Control

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 (no water used). Wet ashing uses a large volume of water and is therefore not considered suitable for this project.

[10] http://www.emt-india.net/process/power_plants/condenser&cooling_sys.htm

Above-ground ash dumping (where ash is stacked in an ash dump within the power station area and the ash dump is rehabilitated (using topsoil and vegetation)) will be utilised. The practice of ashing into the mine pit is not considered to be a feasible option. In this option, the ash is not separated from the coal by means of any type of membrane, and bringing it into contact with the acidic coal will result in metals and other toxic substances leaching out of the ash, at least over a long time period. Previous studies have concluded that this option is not suitable from an environmental perspective due to the potential for groundwater contamination and the low potential for mitigation.

Wastewater generated at the power station will be utilised for dust suppression at the ash dump.

b) Air Emission Control

Burning of coal releases CO_2, SO_x, NO_x, and other pollutants into the atmosphere and air pollution abatement technologies are being explored to minimise associated impacts. The use of air emissions control measures such as use of electrostatic precipitators/fabric filters are also considered. The commitment in this regard is to achieve minimum emission that will be defined in the Air Emissions License.

4.4. Power Line / Grid Connection Alternatives

4.4.1. Power Line Alternatives considered in the Scoping Study

The power generated at the power station is planned to be evacuated into the existing electricity grid at a point to be determined in consultation with Eskom. Two power line routing alternatives were evaluated within this scoping process (refer to Figure 4.5). The majority of the preferred power line servitude is already secured (and authorised) to Eskom for the Mmamabula-Masa transmission lines, which may be utilised for the project. The power line servitude has to be secured and authorised alongside the Eskom Mmamabula-Masa transmission lines, which may potentially also be utilised for the project. The alternative power line route would require the obtaining of a new servitude.

Through the scoping process it was determined that the proposed alternative power line route would cross over a number of coal resources, including the proposed Thabametsi mine open pit area. This alternative is therefore not considered to be a feasible alternative and will not be assessed further in the EIA process.

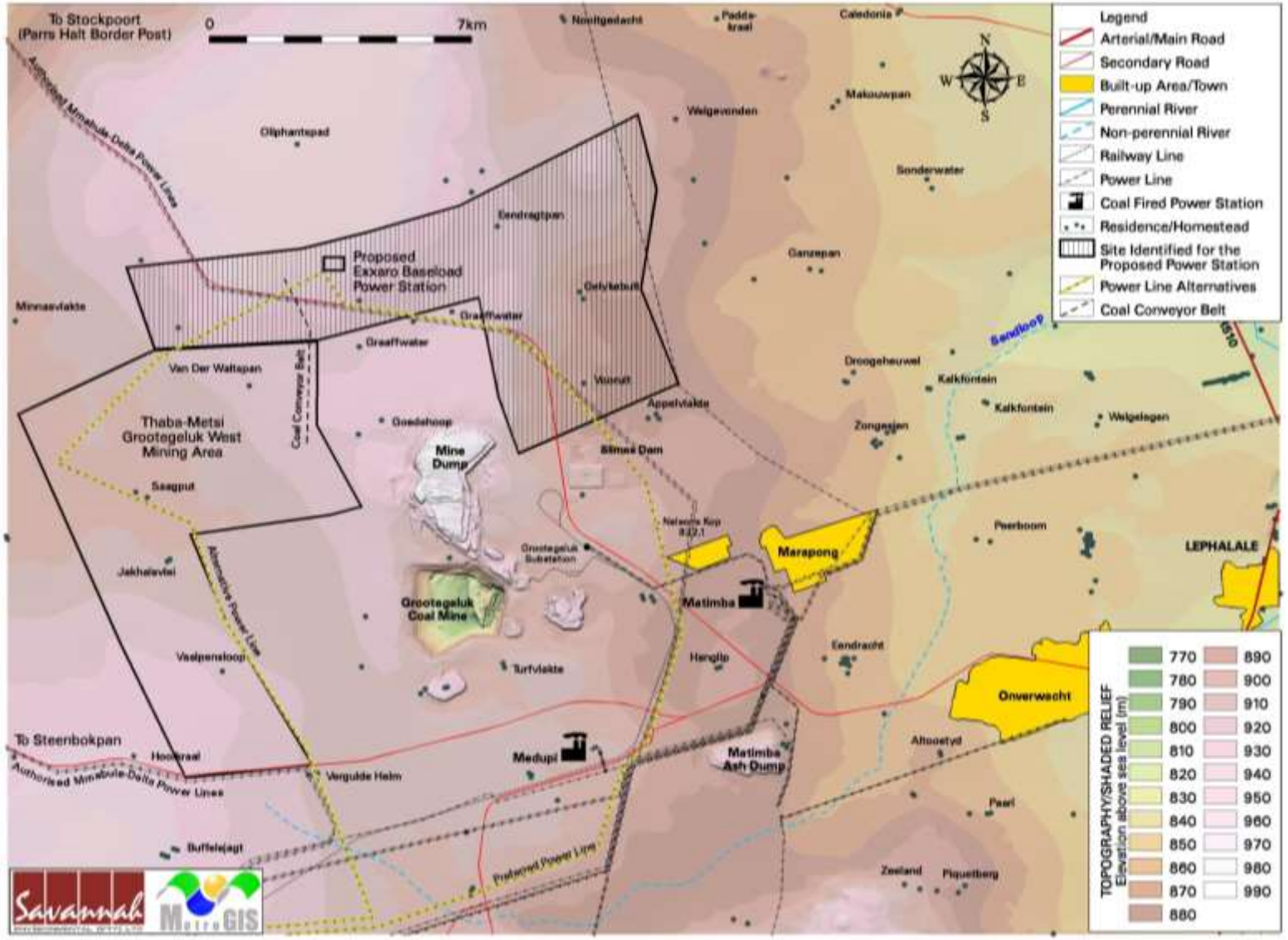


Figure 4.5: Power Line Alternatives for the IPP Power Station considered in the Scoping Phase

4.4.2. Power Line Alternatives considered in the EIA Phase

From further discussions with Eskom regarding connection of the proposed power station to the electricity grid, three connection options have been identified. These are described below and illustrated in Figure 4.6.

- Option 1: Loop-in to the Existing Matimba-Phokoje 400kV line by:
  - Building approximately 7km of 1 x double circuit or 2 x single circuit 400kV lines to loop-in to the existing Matimba-Phokoje line.
  - Establish a 400kV High Voltage yard or sub-station with 400kV Outdoor Switchgear including any reactors required.
- Option 2: Loop-in to a Matimba-Medupi 400kV line by:
  - Building approximately 25km of 1xdouble circuit or 2xsingle circuit 400kV lines to loop-in to a Matimba-Medupi 400kV line preferably midway between Medupi and Matimba.
  - Establish a 400kV High Voltage yard or sub-station with 400kV Outdoor Switchgear including any reactors required.
- Option 3: Connect to the planned Masa substation by:
  - Building approximately 40km of 1 x single circuit 400kV lines to connect to a 400kV line bay at Masa substation. This route follows the authorised Mmamabula-Masa power line servitude.
  - Establish part of the 400kV switch yard at Masa substation.
  - Establish a 400kV High Voltage yard or sub-station with 400kV Outdoor Switchgear including any reactors required.

These alternatives fall within the study area considered within the Scoping Phase of the process and are assessed within this EIA Report.

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 IPP Thabametsi 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. The approach to undertaking this process is detailed in Chapter 3 of this report.

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, the National Department of Environmental Affairs (DEA) is the competent authority.

Therefore, the Project Company requires authorisation from the National Department of Environmental Affairs (DEA), in consultation with the Limpopo Department of Economic Development, Environment and Tourism (LEDET) for the undertaking of the proposed project. In order to obtain this authorisation, the Project Company 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 **14/12/16/3/3/3/40**.

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. The Project Company 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 will be applied for are summarised in Table 1.1.

Table 1.1: Summary of the GN 544, 545 & 546, listed activities number and short description of the activities that require authorisations under NEMA

No & date of relevant notice	Activity No (in terms of relevant Regulation/ notice)	Description of listed activity
GN 544, 18 June 2010	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). ***It is proposed to establish two coal stockpiles on the site. These would require an air emissions license.***
GN 544, 18 June 2010	9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water – (i) with an internal diameter of 0.36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: (a) such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or (b) where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse. ***A water supply pipeline will be required to be constructed to the power station site from the point of supply.***
GN 544, 18 June 2010	10	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; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more. ***Construction of temporary power lines for electricity that is required during construction***
GN 544, 18 June 2010	11	The construction of (iii) bridges; (vi) bulk storm water outlet structures; (x) buildings exceeding 50 square metres in size; or (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. ***Drainage lines occur on the site. These could be impacted by the proposed project.***
GN544, 18 June	12	The construction of facilities or infrastructure for the off-

No & date of relevant notice	Activity No (in terms of relevant Regulation/ notice)	Description of listed activity
2010		stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010. ***Water storage dams associated with the project include a raw water reservoir (120 000m^3 in capacity) and pollution control dams (exceeding 50 000m^3 in capacity)***
GN 544, 18 June 2010	18	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. ***Drainage lines occur on the site. These could be impacted by the proposed project.***
GN 544, 18 June 2010	22	The construction of a road, outside urban areas, (i) with a reserve wider than 13.5 metres or, (ii) where no road reserve exists where the road is wider than 8 metres. ***Constructing access roads to the site.***
GN 544, 18 June 2010	39	The expansion of (iii) bridges within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint but excluding where such expansion will occur behind the development setback line. ***It may be necessary to expand existing roads and associated bridges for access to the power station site. The existing Stokpoort gravel road to be widened and tarred.***
GN544, 18 June 2010 (as amended in November 2013)	55A	The construction of facilities for the treatment of effluent, wastewater or sewage with a daily throughout capacity of more than 2000 cubic metres but less than 15 000 cubic metres. ***Wastewater treatment facilities with a capacity of 6000m^3/day will be constructed as part of the power station infrastructure***
GN 545, 18 June 2010	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more. ***The power station is planned to have a generating capacity of up to 1200MW***
GN 545, 18 June 2010	3	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good,

No & date of relevant notice	Activity No (in terms of relevant Regulation/ notice)	Description of listed activity
		where such storage occurs in containers with a combined capacity of more than 500 cubic metres. ***Storage of dangerous substances (such as fuel, ammonia acid, oils, etc.) would be required at the power station.***
GN 545, 18 June 2010	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. ***A Water Use License will be required 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.***
GN 545, 18 June 2010	8	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex. ***A 400kV HV Yard is planned to be constructed at the power station. 400kV power lines are planned to be constructed from the power station to the grid connection point.***
GN 545, 18 June 2010	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: *(i)* Linear development activities *(ii)* Agriculture or afforestation where activity 16 in this schedule will apply. ***The development footprint will be approximately 650ha in extent.***

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

No & date of relevant notice	Activity No (in terms of relevant Regulation/ notice)	Description of listed activity
GN 921, 29 August 2013	Category B 7	The disposal of any quantity of hazardous waste to land ***The power station will require an ash dump. The ash produced through the power generation process is considered to be hazardous***
GN 921, 29 August 2013	Category B 10	The construction of facilities for a waste management activity listed in Category B of this schedule (not in isolation to associated activity). ***An ash dump will be required to be constructed.***

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 2013 (refer to Appendix C).

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 IPP Thabametsi 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 Limpopo 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).
» Provide an opportunity for DEA and LDEDET representatives to visit and inspect the proposed site, and the study area.
» 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).

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 **12 March – 23 April 2014**. This review period was **extended to 6 May 2014** in order to enable sufficient time for comment following a specialist workshop held on 23 April 2014.

» The comments received from I&APs during this period have been captured within a Comments and Response Report (refer to Appendix D2), which is included within this Final EIA Report, for submission to the authorities for decision-making.
» Focus group meetings and a public meeting/Open Day (pre-arranged and stakeholders invited to attend - for example with directly affected and surrounding landowners) were held on 31 March - 2 April 2014.
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» 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 (refer to Appendix D2). The Comments and Response Report includes responses from members of the EIA project team and/or the project proponent. Where issues were raised that the EIA team considered 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 Scoping 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 5.1: Specialist studies undertaken within the EIA Phase

Specialist	Area of Expertise	Refer Appendix
Umoya Nilu	Air Quality	Appendix E
Bathusi Environmental Consulting	Biodiversity (Flora & Fauna)	Appendix F
Heritage Contracts and Archaeological Consulting CC	Heritage	Appendix G
M2 Environmental Connections CC	Geohydrology	Appendix H
M2 Environmental Connections CC	Noise	Appendix I
Urban-Econ Development Economists	Socio-Economics and land use	Appendix J
Johann Lanz	Soils and agricultural potential	Appendix K
M2 Environmental Connections (Menco)	Surface Water	Appendix L
ITS Engineers	Traffic	Appendix M
MetroGIS	Visual and mapping	Appendix N
Digby Wells	Wetlands	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 represents a technically suitable site for the establishment of the proposed facility.
» It is assumed that the proposed connection to the National Grid is correct in terms of viability and need.
» 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

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 5.2. Table 5.3** provides the relevant South African environmental legislation applicable to the project in terms of environmental quality.

Table 5.2: Relevant legislative permitting requirements applicable to the proposed 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. 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. 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 Limpopo 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). 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. 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
		Limpopo DEDET 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. On-site activities should be limited to 6:00am - 6:00pm, Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
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). Consumptive water uses may include the taking of water from a water resource and storage - Sections 21a and b. 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	Department of Water Affairs Provincial Department of Water Affairs	A water use license (WUL) is required for the following water uses: » 21 a) taking water from a water resource: » 21 b) storing water » 21 c) Impeding and diverting the flow of a watercourse » 21 e) engaging in a controlled activity identified as such in

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	watercourse - Section 21i.		section 37(1) or declared under section 38(1) (i.e. using wastewater for dust suppression) » 21 g) Disposing of waste in a manner which may detrimentally impact on a water resource » 21 h) Disposing in any manner of water which contains waste from or which has been heated in any industrial or power generation process » 21 i) Altering the bed, banks. course or characteristics of a watercourse In terms of the application for water supply from MCWAP2, the date for submission of applications is to be confirmed by the DWA and TCTA. As the Water Use license application process requires that a project submits a consolidated application (i.e. for all water uses), the application for all water uses will only be submitted once the date for submission has been confirmed.
Minerals and Petroleum Resources	A mining permit or mining right may be required	Department of	As no borrow pits are expected to

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Development Act (Act No 28 of 2002)	where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act. 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.	Mineral Resources	be required for the construction of the facility, no mining permit or right is required to be obtained. A Section 53 application will be submitted the Limpopo DMR office.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	S21 – Listed activities requiring an Air Emissions License. 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. Measures in respect of dust control (S32) and National Dust Control Regulations of November 2013. Measures to control noise (S34) - no regulations	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. Measures in respect of dust control (S32) and the National Dust Control Regulations of November 2013.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	promulgated yet. 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.		
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » 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). » 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 G). 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) » A list of threatened and protected species has	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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	been published in terms of S 56(1) - Government Gazette 29657. » 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 and protected species) and GN R 152 (Threatened or Protected Species Regulations). » 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). » This Act also regulates alien and invader species.		protected species. An ecological study has been undertaken as part of the EIA Phase. As such the potentially occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered. This report is contained in Appendix F.
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur.	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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).		developed and implemented. In addition, a weed control and management plan must be implemented. The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. There are none for this project.
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 F)
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. 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	This Act regulates the control of substances that	Department of Health	It is necessary to identify and list

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
15 of 1973)	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 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. 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 Group IV: any electronic product; and Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		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 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. 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.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
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. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. 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. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away.	National Department of Water and Environmental Affairs (hazardous waste) Provincial Department of Environmental Affairs (general waste)	A waste license is required for the ash dump associated with the power station. General waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMPr for the project (refer to Appendix P). The DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste will also need to be considered.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented. GNR 634, 635 and 636 detail the classification of waste as well as the norms and standards for the disposal of waste to landfill. Specifications in terms of liner design required to minimise pollution are detailed in GNR 636.		
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the country	Department of Agriculture	Subdivision of land may be 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. » 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. » 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,	» South African National Roads Agency Limited (national roads) » 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).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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.		
Provincial Legislation			
Limpopo Environmental Management Act / LIMA (Act 7 of 2003)	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 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: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » 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. The Act provides lists of protected species for the Province.	Limpopo Department of Economic Development, Environment and Tourism	A collection/destruction permit must be obtained from LEDET for the removal of any protected plant or animal species found on site. Additionally, a permit for the disturbance or destruction of indigenous species must be applied for.

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 near Lephalale in Limpopo Province. 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

Regionally, the study area is located within the western part of Limpopo Province.

The proposed site, Onbelyk 257 LQ, is located approximately 26km north-west of Lephalale within the Lephalale Local Municipality, which falls within the Waterberg District Municipality. The proposed site is located north of the Grootegeluk Coal Mine, Matimba Power Station and the Medupi Power Station (currently under construction) and adjacent to the proposed Thabametsi coal mine. Figure 6.1 shows the regional location of the site and broader study area.

The R510 between Groblers Bridge Border Post and Thabazimbi is an arterial route giving access to the study area from the east. The R33 runs eastward off the R510. Other roads in the study area are classed as secondary roads and give access to Stockpoort (north-west) and Steenbokpan (west).

The towns of Marapong, Onverwacht and Lephalale represent the populated places within the study area, and lie to the south-east of the proposed site at distances ranging from approximately 13km, 21km to 25km respectively. The Lephalale Local Municipality has an average population density of 4.7 people per km².

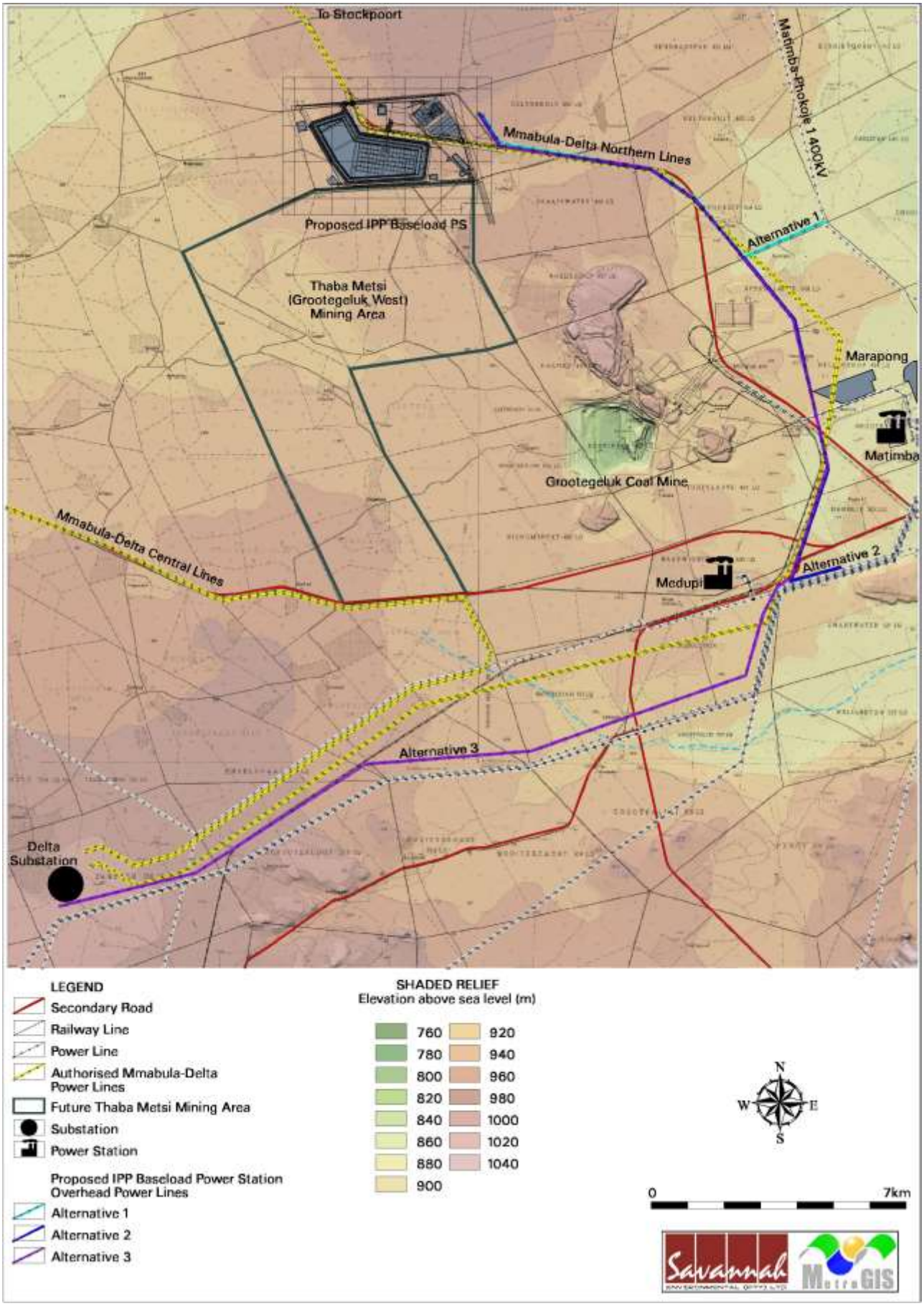


Figure 6.1: Map showing the proposed location of the IPP Waterberg Power Station and surrounding region

6.2 Industrial Character of the Surrounding Region

The site is located in close proximity to the Grootegeluk mine, two coal-fired power stations – Medupi Power Station (soon-to-be-commissioned) and Matimba Power Station - and the proposed new coal mine development (Thabametsi). In addition, other mining and power generation projects are proposed within the broader area. The project site is located within the Limpopo Coal, Energy and Petrochemical cluster, the Lephalale Local Municipality Industrial Corridor and the Waterberg coalfields. Extensive mineral resources (coal) are located within the Lephalale Local Municipality. The Lephalale Local Municipality is acknowledged to be on the verge of major economic development within the mining and power production industries as government policy stated that the Limpopo Coal, Energy and Petrochemical Cluster is a means of utilising the potential of the Waterberg Coal Field to produce energy for the national economy (Lephalale LED, 2008).

6.3 Land Use

In general the land-use of the region consists of a dynamic mosaic of land-uses including industry, mining, game farms, limited agriculture and residential land-use. Prominent land use in the vicinity of the study area is the Grootegeluk Mine, located to the south of the site, and the Matimba Power Station, located to the south-west of the site. Further afield is the Medupi Power Station, which is still under construction, located ~15km to the south west, and the Matimba Ash Dump ~17km to the south- west.

There are extensive game farm and hunting operations within the broader study area, of which three falls within the site boundary. Livestock and agriculture are practiced to a lesser extent. Industrial infrastructure in the study area includes the railway line to the Grootegeluk Mine and major power line infrastructure associated with both the mine and the power stations. These existing power lines are mostly located to the south-west of the proposed site.

Some agricultural land use is evident (yet limited) in the east and north of the study area and along the Mokolo River. It may be expected that agricultural homesteads associated with this land use are to be found throughout the study area. Outside of the urban, industrial and mining areas, land cover is mostly thicket and bushland with large patches of woodland in the west and south of the study area, as well as along the Mokolo River. Vegetation types include Sweet Bushveld and Mixed Bushveld. The proposed site falls within an area for which Exxaro has surface rights, but falls outside of the actual mining area (Grootegeluk Mine) and the future mining area for the Thabametsi Mine.

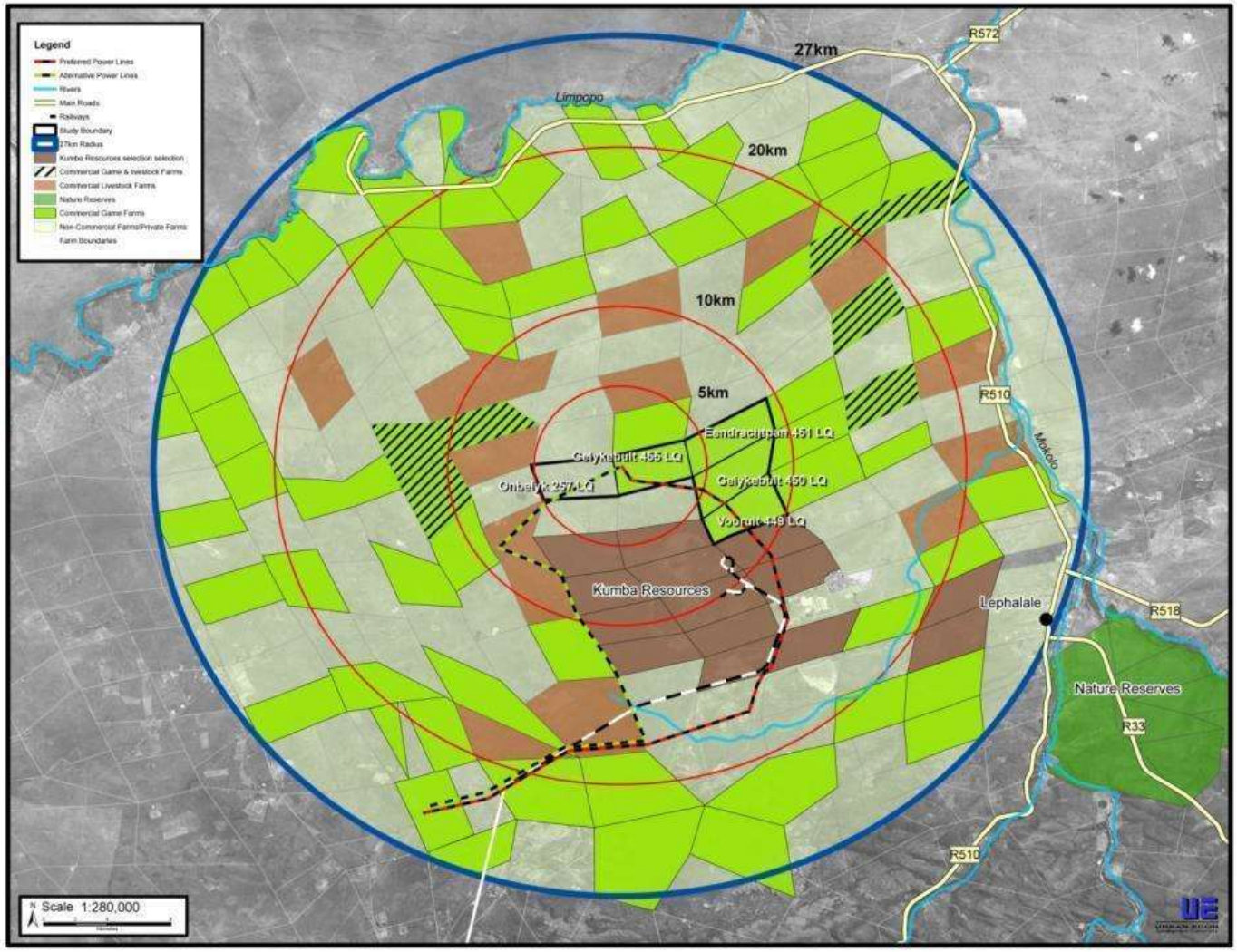


Figure 6.2: Land uses in the study area

6.4 Climate

Maximum temperatures during summer exceed 30°C and maximum winter temperature averages 23°C. Figure 6.3 indicates that the proposed site is located in an area that receives summer rainfall. Precipitation usually occurs in the form of convectional thunderstorms. The average annual rainfall is approx. 600 mm, with the high rainfall experienced in the months between October and March.

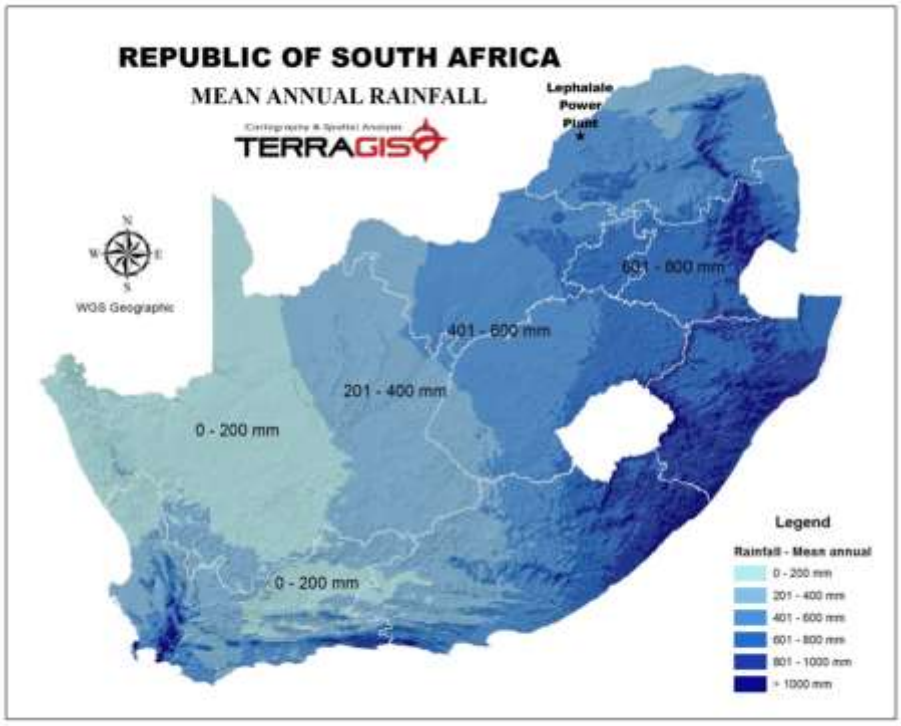


Figure 6.3: Rainfall map of South Africa indicating the survey site

6.5 Topography

The broader study area (i.e. the entire extent of the maps) occurs on land that ranges in elevation from about 810m above sea level (asl) along the drainage lines in the north east, to about 930m asl in the west. The most prominent topographical features are the mine and ash dumps. The largest of these is the Grootegeluk mine dump to the south of the site which rises to a height of about 99m asl. The terrain immediately surrounding the proposed site has an even slope (slope gradient equal to, or less than 2.15%), whilst the terrain type of the region is described as plains.

The perennial Mokolo River bisects the far north-eastern corner of the study area, and its non-perennial tributary, the Sandloop, traverses the study area from south west to north east. The proposed site for the power station is located along the southern slope of a weak ridge that forms the western watershed boundary of

the Mokolo River catchment. The Oliphantspad homestead is located near the approximate top of this ridge.

6.6 Geology

The geology of Onbelyk farm comprises mostly of Clarens Arenites, consisting of fine-grained, Aeolian sandstones. In the Waterberg Coalfields, the formation occupies extensive areas on both sides of the Mokolo River. The site is covered by a blanket of hillwash to depths of approximately 2 m in depth. Parts of the proposed power lines comprises of the Sandriviersberg & Mogalakwena Arenites. The western part of the Onbelyk farm comprises the Drakensberg Karoo geological unit. Shales in the Waterberg coalfields are situated in a fault trough. The basal part is composed of yellowish and reddish shale and reddish-brown mudstone which was apparently deposited in a valley in the pre-Karoo landscape.

The major geological formations of the region are illustrated in Figure 6.4. It would appear as if the underlying geological patterns do not have a significant effect on the vegetation development as no particular and obviously dissimilar patterns are observed that would be resultant from geological boundaries. However, fine-scaled variations are observed on ground level that is attributed to substrate conditions, to which the geology plays a determining part.

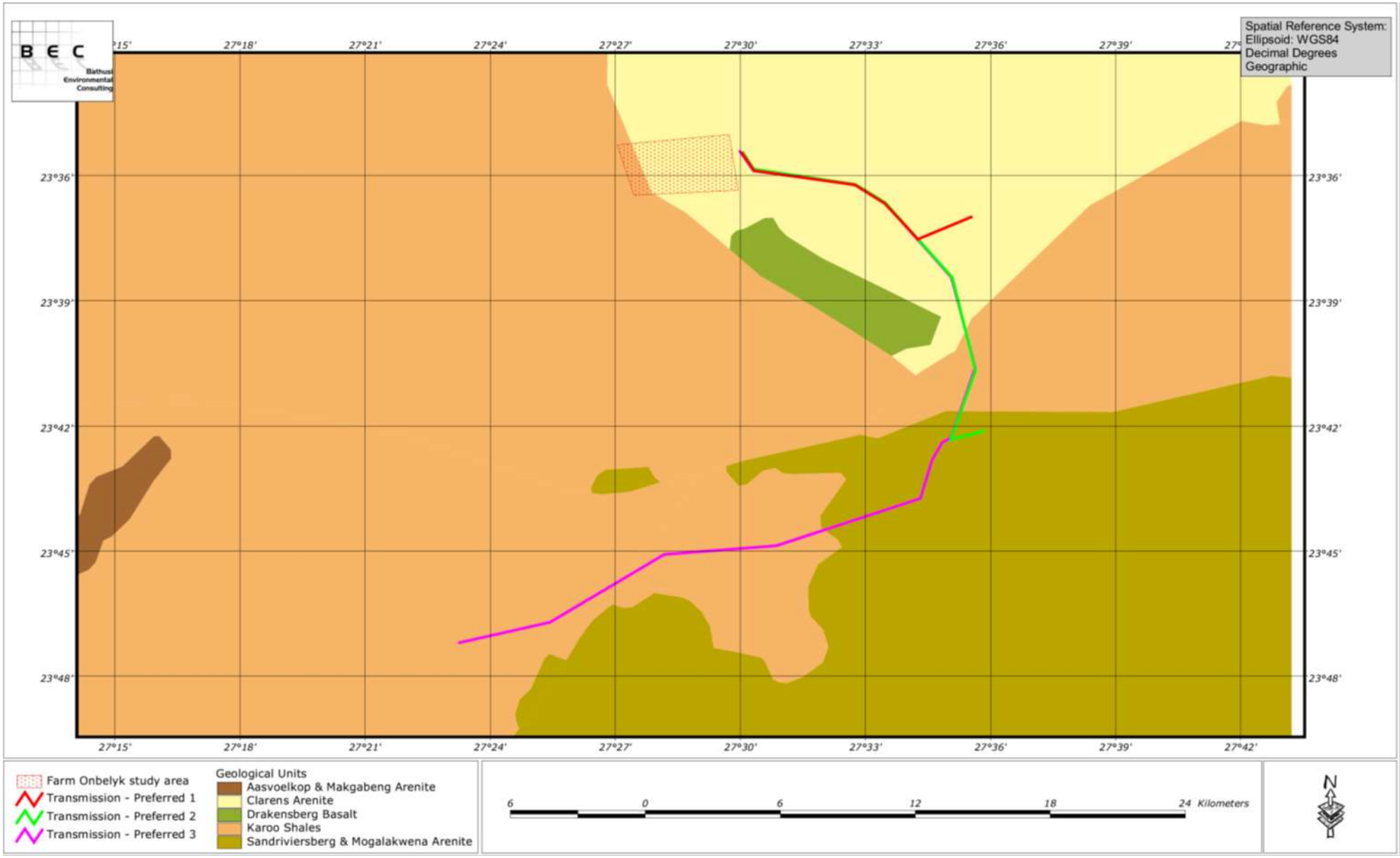


Figure 6.4: Geology of the study area

6.7 Surface Water

The study area is situated within the Limpopo Catchment area (See Figure 6.5). Major rivers of the surrounds include the Mogol River (approximately 14km to the east) and the Limpopo River (approximately 18km to the north). A pan and associated alluvial plains are present in parts of the study area, particularly Gelykebult 450, Gelykebult 455 and Vooruit 449. This type of plain is formed over a long period by a river depositing sediment on its floodplain or bed, which becomes alluvial soil. The difference between a floodplain and an alluvial plain is that the floodplain represents the area experiencing flooding fairly regularly in the present or recently, whereas an alluvial plain includes areas where the floodplain is now and used to be, or areas which only experience flooding a few times a century. The status of this area is regarded as being relatively degraded and it would appear as if flow periods are extremely sporadic.

a. Catchments:

Due to the low rainfall that is experienced in the Limpopo Province, relatively little surface runoff is generated in the Limpopo Water Management Area. The surface water study area for the ~~Exarro~~ Thabametsi Power Station falls within the Limpopo Water Management Area. The Mokolo River and Matlabas River are two of the seven major rivers in the Limpopo WMA. The catchments are mostly independent of each other and the rivers drain into the Limpopo River. The Crocodile (West) and Marico WMA borders the Limpopo WMA in the south-west.

The various drainage areas for the Limpopo WMA are described in Table 6.1. The runoff is highly seasonal and variable with intermittent flow in many of the tributaries. The exception in the Limpopo WMA is the Waterberg which is relatively well-watered with strong base-flows.

Most of the surface runoff in the WMA is contributed by the Mokolo and Mogalakwena Rivers. Both these rivers originate in the Waterberg and drain much of the Waterberg catchment as depicted in Figure 6.5**.**

Table 6.1: WMA 1 quaternary drainage areas

Catchment/Sub-area	Quaternary Drainage Areas
Matlabas / Mokolo	A41A-E and A42A-H
Lephalala	A50A-J
Mogalakwena	A61A-H, 62A-J and 63A-E
Sand	A71A-L and A72A-B
Nzhelele / Nwanedzi	A80A-J

Figure 6.5: Delineation of the Mokolo Water Management Area

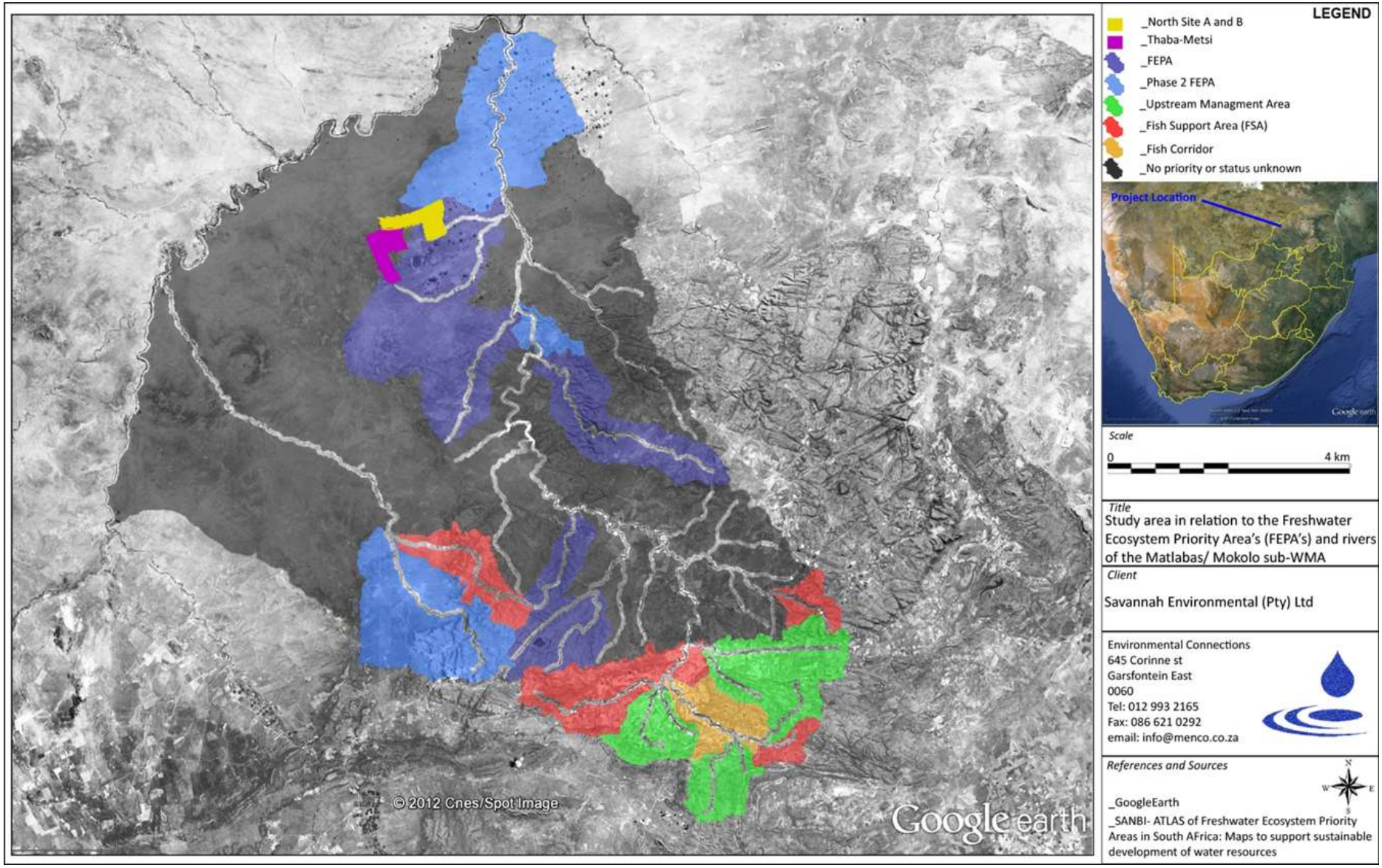


Figure 6.6: Location of the IPP Waterberg site in relation to the freshwater Ecosystems Priority Area (FWPA)

b. Rivers in the broader study area

The water resources within the vicinity of the project area include:

» Sandloop;
» Mokolo River;
» Matlabas River
» Riet Spruit ; and
» Limpopo River

These rivers had been classified by the Department of Water Affairs as being perennial (apart from Sandloop that is non-perennial river) having a Present Ecological Status (PES) of Class C, implying a moderately impacted river system. The Status of the River Report (2006) for the Mokolo River has classified the Middle Mokolo Region as follows:

» Ecostatus: Fair
» EIS: Moderate

c. Drainage Lines/ Watercourse on the Site

A number of watercourses flow through the study area. The watercourses are regarded as non-perennial tributaries that feed into the Mokolo River system. . A single non-perennial tributary traverses the project site in a west-easterly direction. Two other non-perennial watercourses were identified within the project area. These watercourses drain the project area towards the south-easterly direction eventually feeding into the Mokolo River north of the town of Lephalale. The above-mentioned non-perennial watercourses have not been affected by anthropogenic impacts since the project site is currently used as a game reserve. Trampling of the watercourses is however expected as a result of the concentration of animals within the project area.

d. Wetlands

Two hydro-geomorphic types were identified. Pans to the east of the site were situated within bleached sandy soils as part of temporary drainage. Environmental factors that influence the formation of non-perennial pans may include availability of geologically susceptible surfaces, surface disturbance by animals and salt weathering, lack of integrated drainage system and deflation processes including wind action. Pans were found to be either bare, surrounded by woodland, or supported grass stands of hydromorphic species *Cymbopogon validus*. The proposed project area is located in close proximity to the wetland units identified (refer to Figure 6.7).

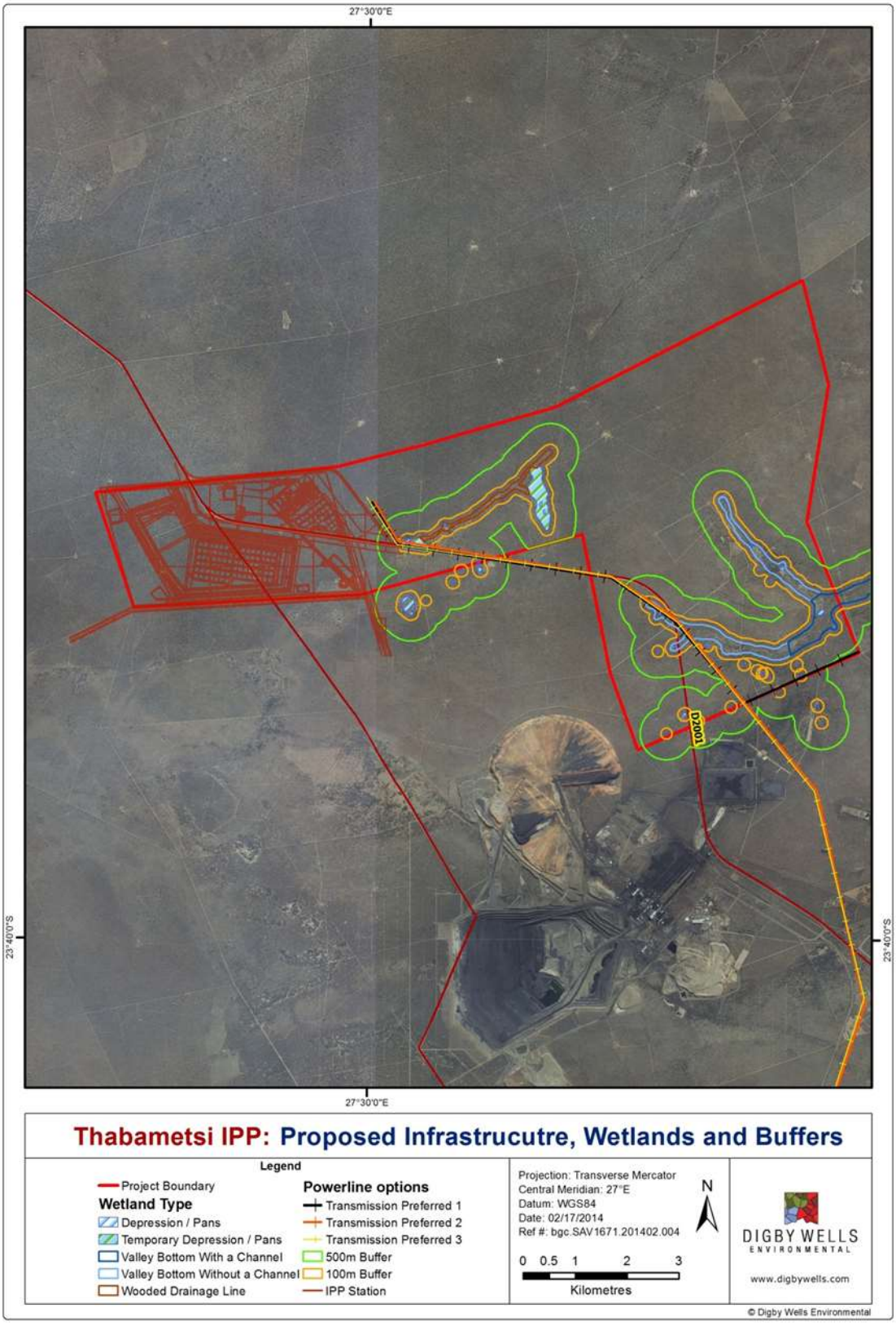


Figure 6.7: Wetland areas identified within the study area

Overgrazing and cases of erosion were documented to impact on geomorphology. Pans in the area were however, regarded as largely natural.

With regard to wetland functionality, pans on site scored well for maintenance of biodiversity owing to their largely natural state. In addition, they also provide water for game species and birds on site and provide suitable services related to tourism and recreation.

6.8. Groundwater

According to the 1:500 000 General hydrogeological Map (Pietersburg 2326) the area beneath the site is characterised by weathered and fractured aquifers with borehole yields generally of 0.3 – 3.0 l/s. The hydrogeology of the area can be described in terms of the unsaturated and saturated zones.

» *Unsaturated Zone*
Although a detailed characterisation of the unsaturated zone is beyond the scope of this study, a brief description thereof is supplied. The unsaturated zone is likely to consist of colluvial sediments at the top, underlain by residual sandstone of the Clarens Formation that becomes less weathered with depth. The thickness of the unsaturated zone can be determined from water levels measured during the hydrocensus. Experience of Karoo geohydrology indicates that recharge to the perched groundwater aquifer is relatively high, up to 3% of the Mean Annual Precipitation (MAP).

» *Saturated Zone*
In the saturated zone, at least four aquifer types may be inferred from knowledge of the geology of the area:

- A shallow aquifer formed in the weathered zone, perched on the fresh bedrock.
- An intermediate aquifer formed by fracturing of the Karoo sediments.
- Aquifers formed within the more permeable coal seams and sandstone layers.
- Aquifers associated with the contact zones of the dolerite intrusions.

Although these aquifers vary considerably regarding geohydrological characteristics, they are seldom observed as isolated units. Usually they would be highly interconnected by means of fractures and intrusions. Groundwater will thus flow through the system by means of the path of least resistance in a complicated manner that might include any of these components.

6.8.1. Aquifers

» *Fractured Karoo rock aquifers*
The area consists of consolidated sediments of the Karoo Supergroup and consists mainly of sandstone and shale and coal beds of the Clarens and Eendracht Formation. The geology map for the area does indicate major fracture or fault zones in this area especially associated with the Daarby fault, from experience it can be assumed that numerous major and minor fractures do exist in the host rock as a result of these faults zones and stress release. These conductive zones effectively interconnect the strata of the Karoo sediments, both vertically and horizontally into a single, but highly heterogeneous and anisotropic unit.

» *Aquifers associated with coal seams*
The coal seam forms a layered sequence at various depths within the hard rock sedimentary units. The margins of coal seams or plastic partings within coal seams are often associated with groundwater. The coal itself tends to act as an aquitard allowing the flow of groundwater at the margins.

» *Aquifers associated with dolerite intrusives*
Dolerite intrusions in the form of dykes and sills are common in the Karoo Supergroup, and are often encountered in this area. These intrusions can serve both as aquifers and aquitards. Thick, unbroken dykes inhibit the flow of water, while the metamorphosed and cracked contact zones can be highly conductive. These structures thus tend to dominate the flow of groundwater. Unfortunately, their location and properties are rather unpredictable. Their influence on the flow of groundwater is incorporated by using higher than usual flow parameters for the sedimentary rocks of the aquifer.

6.9. Vegetation

The regional vegetation corresponds to the Savanna Biome as defined by Mucina & Rutherford (Vegmap, 2006). The farm Onbelyk and most of the proposed power lines are represented by the Limpopo Sweet Bushveld ecological type, while the southern section of Preferred 3 line is represented by the Western Sandy Bushveld ecological type (refer to Figure 6.8).

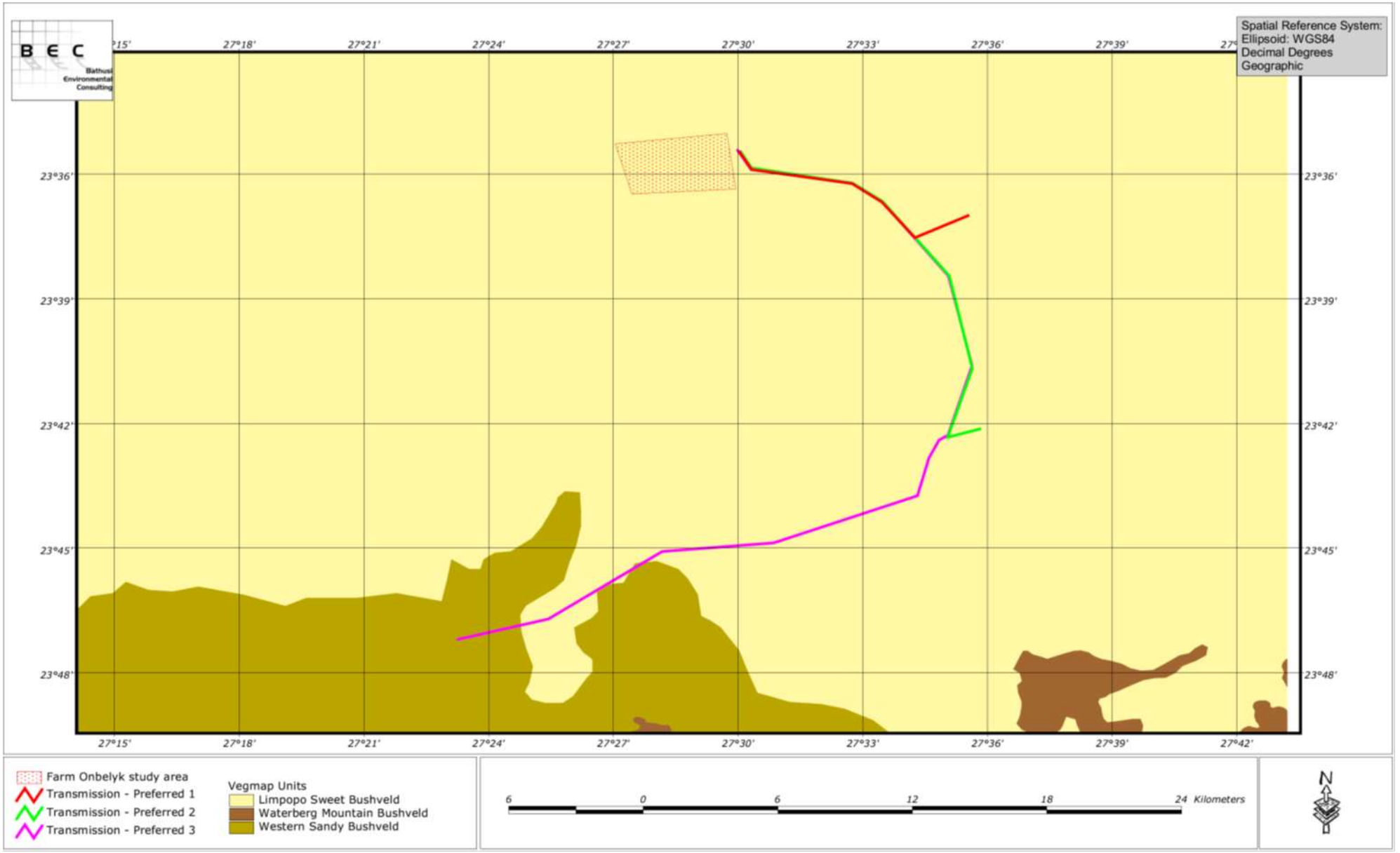


Figure 6.8: Vegetation Map for the Broader study Area

6.9.1. Limpopo Sweet Bushveld

The Limpopo Sweet Bushveld extends from the lower reaches of the Crocodile and Marico Rivers down the Limpopo River valley. It is short, open woodland dominated by *Acacia mellifera* and *Dichrostachys cinerea* as well as taller tree species such as *A. robusta*, *A. burkei* and *Terminalia sericea*. The high palatability of the graminoid composition renders this vegetation type highly suitable for game farming practices.

Although this vegetation type is regarded not threatened (Least Threatened), only 1 % is formally conserved in statutory conservation areas. Much is however contained within private nature reserves and game farms. Approximately 5 % is transformed by cultivation. Though limited by low rainfall, this is a good area for game and cattle farming due to the high grazing capacity of sweet veld.

The Central Bushveld endemic herb *Piaranthus atrosanguinalis* occurs in this vegetation type. Noteworthy taxa include the following.

» **Tall Trees**
Acacia robusta and *A. burkei.*

» **Small Trees**
Acacia erubescens, A. fleckii, A. nilotica, A. senegal var*. rostrata, Albizia anthelmintica, Boscia albitrunca, Combretum apiculatum* and *Terminalia sericea.*

» **Tall Shrubs**
Catophractes alexandri, Dichrostachys cinerea, Phaeoptilum spinosum, Rhigozum obovatum, Cadaba aphylla, Combretum hereroense, Commiphora pyracanthoides, Ehretia rigida subsp*. rigida, Euclea undulata, Grewia flava* and *Gymnosporia senegalensis.*

» **Low Shrubs**
Acacia tenuispina, Commiphora africana, Felicia muricata, Gossypium herbaceum subsp*. africanum* and *Leucosphaera bainesii.*

» **Graminoids**
Digitaria eriantha subsp*. eriantha, Enneapogon cenchroides, Eragrostis lehmanniana, Panicum coloratum, Schmidtia pappophoroides, Aristida congesta, Cymbopogon nardus, Eragrostis pallens, E. rigidior, E. trichophora, Ischaemum afrum, Panicum maximum, Setaria verticillata, Stipagrostis uniplumis* and *Urochloa mosambicensis.*

» **Herbs**
Acanthosicyos naudinianus, Commelina benghalensis, Harpagophytum procumbens subsp*. transvaalense, Hemizygia elliottii, Hermbstaedtia odorata, Indigofera daleoides, Kleinia fulgens* and *Plectranthus neochilus.*

6.9.2. Western Sandy Bushveld

This vegetation type occurs on flats and undulating plains from Assen northwards past Thabazimbi and remaining west of the Waterberg Mountains towards Steenbokpan in the north. Some patches occur between the Crocodile and Marico Rivers to the west. The vegetation varies from tall open woodland to low woodland, broad-leaved as well as microphyllous tree species prominent. Dominant species include *Acacia erubescens* on flat areas, *Combretum apiculatum* on shallow soils of gravely upland sites and *Terminalia sericea* on deep sands. This unit is strongly associated with slightly undulating plains. The conservation status of this unit is Least Threatened. About 6% is statutorily conserved, just over half of which in the Marakele National Park. About 4% is transformed, mainly by cultivation

Important taxa include the following:

» **Tall Trees**
Acacia erioloba, A. nigrescens and *Sclerocarya birrea* subsp*. caffra.*

» **Small Trees**
Acacia erubescens, A. mellifera subsp*. detinens, A. nilotica, A. tortilis* subsp*. heteracantha, Combretum apiculatum, C. imberbe, Terminalia sericea, Combretum zeyheri, Lannea discolor, Ochna pulchra* and *Peltophorum africanum.*

» **Tall Shrubs**
Combretum hereroense, Euclea undulata, Coptosperma supra-axillare, Dichrostachys cinerea, Grewia bicolor, G. flava and *G. monticola.*

» **Low Shrubs**
Clerodendrum ternatum, Indigofera filipes and *Justicia flava.*

» **Graminoids**
Anthephora pubescens, Digitaria eriantha subsp. *eriantha, Eragrostis pallens, E. rigidior, Schmidtia pappophoroides, Aristida congesta, A. diffusa, A. stipitata* subsp*. graciliflora, Eragrostis superba, Panicum maximum* and *Perotis patens.*

» **Herbs**
Blepharis integrifolia, Chamaecrista absus, Evolvulus alsinoides, Geigeria burkei, Kyphocarpa angustifolia, Limeum fenestratum, L. viscosum, Lophiocarpus tenuissimus and *Monsonia angustifolia.*

The conservation status of this unit is regarded Least Threatened with about 6 % statutorily conserved, just over half of which in the Marakele National Park. About 4 % transformed, mainly by cultivation. This unit is drier than the Central Sandy Bushveld vegetation unit and is distinguished from it by the presence of such species as Acacia erubescens, A. nigrescens and Combretum imberbe and general absence of species such as Burkea africana and Ochna pulchra.

6.9.3. Flora species of Conservation Importance of the Region

South Africa's Red List system is based on the IUCN Red List Categories and Criteria Version 3.1 (finalized in 2001), amended to include additional categories to indicate species that are of local conservation concern. The IUCN Red List system is designed to detect risk of extinction. Species that are at risk of extinction, also known as threatened or endangered species are those that are classified in the categories Critically Endangered (CR), Endangered (EN) and Vulnerable (VU). No such species is known to occur in the ¼-degree grids in which the study area is located. Taking the habitat that is available as well as the status thereof into consideration, it is regarded unlikely that any plant species included in the Threatened category might be present within the study areas.

» A species is Data Deficient when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
» A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
» A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria.
» A species is Threatened when it is included in one of the Critically Endangered (Possibly Extinct), Critically Endangered, Endangered or Vulnerable categories

Red Data plant taxa known to occur in the ¼-degree grids that are spatially represented in the study area include the following:

Binomial Name	***Family***	***Status***
Acalypha caperonioides var. *caperonioides*	Euphorbiaceae	Data Deficient
Corchorus psammophilus	Malvaceae	Threatened
Eulalia aurea	Poaceae	Near Threatened
Euphorbia waterbergensis	Euphorbiaceae	Rare

In terms of the National Forests Act of 1998, certain tree species can be identified and declared as protected. All trees occurring in natural forests are also protected in terms of the Act. Protective actions take place within the framework of the Act as well as national policy and guidelines. Trees are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilization. In terms of the National Forests Act of 1998, protected tree species may not be "cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold, except under license granted by the Department of Water Affairs and Forestry (or a delegated authority)". It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to protected tree species on the property for the submission of relevant permits to authorities prior to the disturbance of these individuals.

In addition to the species currently captured in the SANBI infobase (POSA, 2011), the following protected trees and herbs are known to occur within the immediate region:

Binomial Name	***Family***	***Status***
Acacia erioloba	Fabaceae	Declining, Protected tree
Adansonia digitata	Bombaceae	Protected tree
Boscia albitrunca	Capparaceae	Protected tree
Combretum imberbe	Combretaceae	Protected tree
Duvalia polita	Apocynaceae	Protected species
Huernia transvaalensis	Apocynaceae	Protected species
Huernia zebrina	Apocynaceae	Protected species
Securidaca longipedunculata	Polygalaceae	Protected tree
Sclerocarya birrea subsp. *africana*	Anacardiaceae	Protected tree
Spirostachys africana	Euphorbiaceae	Protected tree

Camel Thorn and Shepherds Trees do occur on the site and are shown in Figures 6.9 and 6.10. Based on international distribution data, this species (Camel Thorn and Shepherds Trees are not currently afforded a national or provincial conservation status. However, because of a high scarcity factor within South Africa (confined to only a small area in the Lephalale region), this species is regarded highly for the purpose of this (and subsequent) investigations. This species is regarded more important than other protected trees that occur widespread in the region and preference ratings for respective sites will take cognisance of the presence/ absence of this species.

Figure 6.9: Example of the protected *Acacia erioloba* (Camel Thorn)

Figure 6.10: Example of the protected *Boscia albitrunca* (Shepherd's Tree)

6.10. Fauna

During previous and on-going studies in the immediate vicinity of the study area during the past years, a total 332 animal species have been confirmed to occur in the study area and immediate surrounds (approximately an area of 100 km²) surrounding the study area. The following results were obtained during previous surveys:

» 53 invertebrate species;
» 9 frog species;
» 20 reptile species;
» 204 bird species; and
» 46 mammals.

The diversity of animals recorded in the region included eighteen Red Data species, namely:
» Giant Bullfrog: *Pyxicephalus adspersus* Tschudi, 1838;
» Black Stork: *Ciconia nigra* (Linnaeus, 1758);
» Secretarybird: *Sagittarius serpentarius* (J.F. Miller, 1779);
» White-backed Vulture: *Gyps africanus* Salvadori, 1865;
» Tawny Eagle: *Aquila rapax* (Temminck, 1828);
» Martial Eagle: *Polemaetus bellicosus* (Daudin, 1800);
» Lesser Kestrel: *Falco naumanni* (Fleischer, 1818);
» Kori Bustard: *Ardeotis kori* (Burchell, 1822);
» Red-billed Oxpecker: *Buphagus erythrorhynchus* (Stanley, 1814);
» Bushveld Elephant Shrew: *Elephantulus intufi* (A. Smith, 1836);
» Ground Pangolin: *Manis temminckii* (Smuts, 1832);
» Bushveld Gerbil: *Tatera leucogaster* (Peters, 1852);
» Cheetah: *Acinonyx jubatus* (Schreber, 1775);
» Brown Hyaena: *Parahyaena brunnea* (Thunberg, 1820);
» Honey Badger: *Mellivora capensis* (Schreber, 1776);
» Southern Sable Antelope: *Hippotragus niger* (Harris, 1838); and
» Western Tsessebe: *Damaliscus lunatus* (Burchell, 1823).

The presence of 98 animal species was confirmed on the site, including:
» 22 invertebrate species;
» 1 frog species;
» 3 reptile species;
» 53 bird species; and
» 19 mammals.

Three Red Data species were recorded during the survey period, namely:
» Tawny Eagle (*Aquila rapax* Temminck, 1828);
» Leopard (*Panthera pardus* Linnaeus, 1758); and
» Brown Hyaena (*Parahyaena brunnea* Thunberg, 1820).

The diversity of animals recorded in the study area included two Alien and Invasive species, namely:
» *Acridotheres tristis* (Common Myna); and
» *Equus asinus* (Donkey).

Two Faunal habitat types were recorded in the on the site: Degraded Woodland Habitat; and Natural Woodland Habitat. The following habitat types were recorded along the power line alternatives:

» Degraded Woodland;
» Floodplain Woodland;
» Natural Woodland;
» Rocky Outcrop; and
» Transformed Habitat.

6.11 Conservation Planning – Important Biodiversity Areas

Currently, there are nine declared land-based protected areas in the Lephalale Local Municipality, comprising 89,406 ha (4.6 % of the municipality). However, there are no biospheres, conservancies or other declared areas of conservation present in the immediate surroundings of the study area. The study area however comprises several of the Exxaro-owned farms that are managed as conservation areas, including a breeding programme for rare species such as Sable. The closest area of conservation is the D'Njala Nature Reserve, situated approximately 14 km to the south-east of the site.

6.12 Land Types (Soils) and Agricultural Potential

There is only a single land type across the power station site, namely Ah85. Soils of this land type are deep, well-drained, structureless, yellow to red sands, predominantly of the Hutton and Clovelly soil forms. These soils would predominantly fall into the Oxidic soil group, with some falling into the Cumulic group, according to the classification of Fey (2010). The proposed power line connection from the site crosses four other land types (refer to Figure 6.11). Ah86 is very similar to Ah85. Bd46 and Bd44 include plinthic soils that have some drainage limitations in the subsoil. Ae252 generally has higher clay content than the Ah land types and includes some shallow soils on underlying rock. The field investigation indictaed that soils across the power station site are very uniform, deep, well-drained, light-yellow coloured sands of the Clovelly soil form tending in places to the Fernwood form.

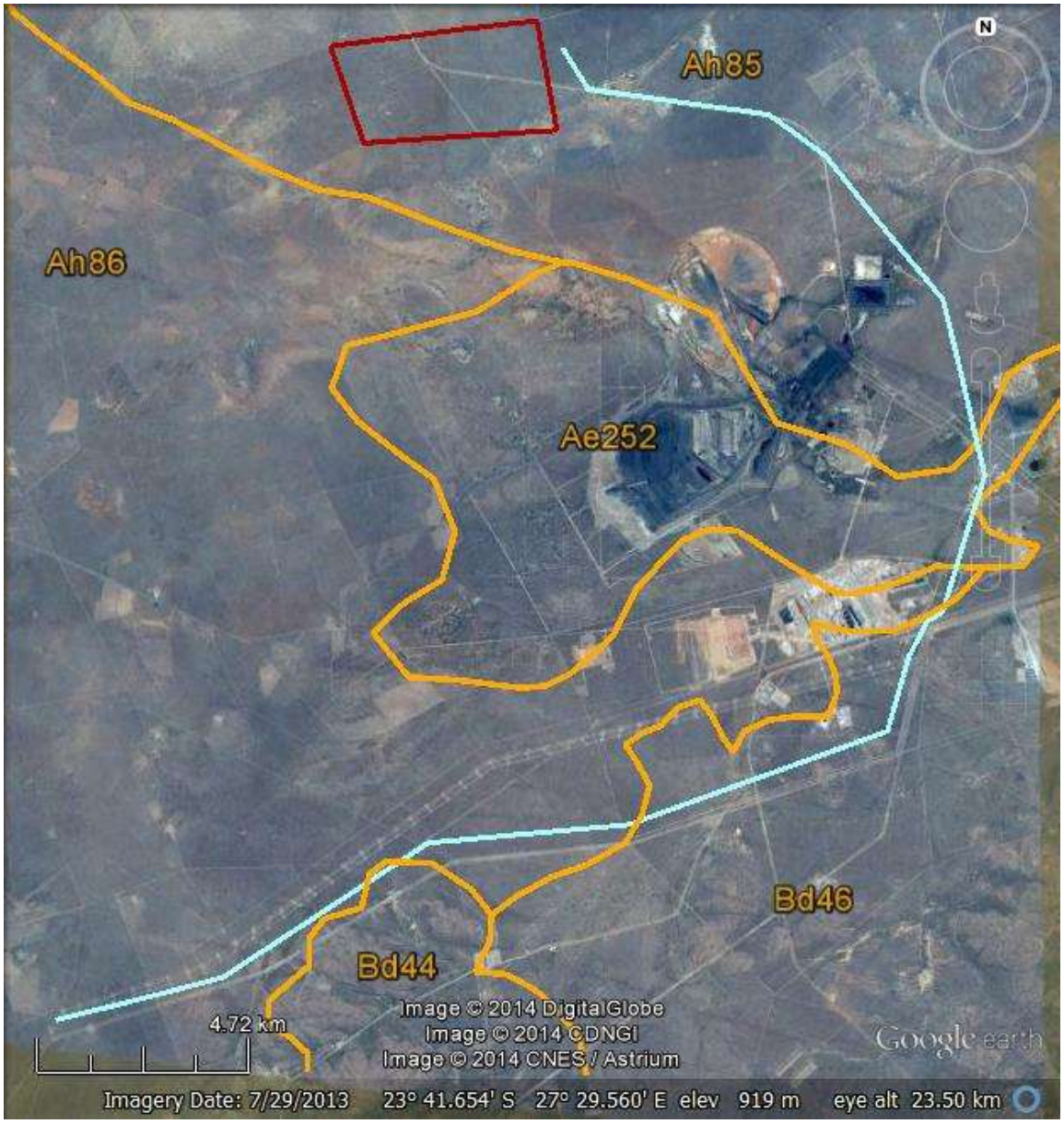


Figure 6.11*:* Satellite image of site. Red = farm Onbelyk which is power station site (1074ha); light blue = longest of the power line options; yellow = land type labels and boundaries.

6.12.1. Agricultural capability

Land capability is the combination of soil suitability and climate factors. The power station site has a land capability classification, on the 8 category scale, of Class 5, non-arable, moderate potential grazing land. The proposed power line route also passes largely through class 5 land with one short section through class 4, marginal potential arable land. The land has a low to moderate water erosion hazard (class 5), but due to the sandy texture it is highly susceptible to wind erosion.

Agricultural limitations are the sandy texture of the soils, which limits their water and nutrient holding capacity, and the limited climatic moisture availability.

Another indication of agricultural capability is the grazing capacity which is given as between 11 and 13 hectares per animal unit. Although it is not a maize producing area, the potential maize yield (as estimated according to Schulze) indicates general agricultural capability and is given on AGIS as between 2 and 3 tons per hectare.

Given the land capability of class 5, based on soil and climate, the site is only suitable as grazing for cattle or game.

The site falls within a cattle producing agricultural region. Much of the surrounding land, including the power station site and much of the power line servitude, is operated as game farm and hunting area. The farm Onbelyk, which is the power station site, is owned and operated by Exxaro Resources. Apart from game watering points, there is no agricultural infrastructure on the site or power line servitude, and no cultivation.

6.13 Social Characteristics of the Study Area and Surrounds

The Lephalale Local Municipality is the largest local municipality within the Limpopo Province. It falls within the Waterberg District Municipality (DM), which is largely characterised by dispersed and fragmented urban areas. The Municipality is located in the north-western part of the Waterberg DM and is part of the international border between South Africa and Botswana, being a recognised gateway to other Southern African countries. The proposed project is located ~17km from the town of Lephalale (Ellisras/Onverwacht/Marapong). The urban areas are predominantly located alongside the N1, N11 and R33 and within the Limpopo catchment area and industrial hubs. Low rainfall within the primary study area is the cause for land-use conflict between low-intensity uses (game farming, agronomy and conservation) and high-intensity uses (urban development and mining) (Waterberg EMF, 2010).

Lephalale is a predominantly rural municipality consisting of 38 villages, 49 proclaimed townships, three informal settlements adjacent to urban nodes, specifically mining activities, and one town (Lephalale). All the townships are located around the Lephalale town with the exception of Thabo-Mbeki, which is about 85km away (Lephalale IDP, 2011/2012). There are 51 recognised towns within the Waterberg DM (Quantec, 2010).

6.13.1. Demographic profile

Spatially, Lephalale is the largest Municipality within the Waterberg District Municipality, yet the total population of 87 689 accounts for 14% of the District's population and 15.7% of its household numbers. A decline in population growth with an average rate of 1.2% from 2005 onwards illustrates an out-migration trend observed in the Lephalale LM. One would assume that population and employment growth within Lephalale LM for the past decade would have a positive growth rate, specifically upon the commencement of the Medupi Power Station and the proclamation of Lephalale as the Limpopo Coal, Energy and Petrochemical Cluster.

The Computer Science Research Institute (CSRI) (2008) contends that there is a clear trend of in-migration to nodes such as the Lephalale town that offer services and employment opportunities that rural areas do not possess. Furthermore, inconsistencies with regard to population growth may occur due to a dramatic trend of out-migration of people from rural areas to urban areas, Gauteng (five hours from the Lephalale town), and coastal regions being the dominant migratory areas (CSRI, 2008). This could mean that the out-migration from rural area in Lephalale exceeded the in-migration trends to the town of Lephalale and its surrounds. Furthermore, much of the development in the Lephalale area was so far attributed to construction activities that imply temporary influx of workers and employment that is most likely captured in other parts of the country. Furthermore, since the latest census results are not yet known and the previous census was undertaken in 2001, it is possible that statistics have not been able to capture the temporary increases in local population trends in the area.

Given the above migratory trend delineated by the CSRI (2008), the disparity of negative employment and population growth within the study area is guaranteed due to the out-migration of the population in rural areas outweighing the in-migration into the Lephalale town and surrounds. Regardless of the negative growth rate for both employment and population; between the period 2008 – 2010, an improvement from a negative 8.1% to a negative 1.8% growth, and negative 2% to positive 0.7% respectively is evident.

6.13.2. Economic profile

The structure of the economy and the composition of its employment provide valuable insight into the dependency of an area on specific sectors and its sensitivity to fluctuations of global and regional markets. Knowledge of the structure and the size of each sector are also important for the economic impact results' interpretation, as it allows the assessment of the extent, to which the

proposed activity would change the economy, its structure and trends of specific sectors.

The size of the Lephalale Municipality in terms of Gross Value Added (GVA) was estimated to be around R5 476 million in 2011 in nominal terms. While the economic growth rates in 2009 and 2010 were negative following the domestic energy crisis and the global financial crisis, in 2011, the Lephalale economy grew by 1.0%. The Lephalale economy largely comprises of the mining and services sectors that contributed to its overall growth in 2011. Coal mining activities account for more than half of the value added generated by activities in Lephalale. Coal mining, though, is directly dependent on the demand for coal created by the local energy generating sector, thus it can be suggested that the sustainability of the existing local employment opportunities are indirectly reliant on the future growth of the local electricity generating industry and other industries that use coal production inputs.

6.13.3. Labour force and Employment Structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being. The following paragraphs examine the study area's labour market from a number of angles, including the employment rate and sectoral employment patterns.

In 2010, 32 million people were within the working age in South Africa. Of these, 15.7 million were non-economically active and 16.2 million formed the labour force. Concurrently, the labour force participation rate was 50.8% meaning that in 2010 just over half of the working population in South Africa were either employed or unemployed. The number of employed people in South Africa amounted to just above 12 million people, leaving 4.2 million people or 25.9% of the labour force unemployed.

In comparison, the local municipality of Lephalale consisted of 55 544 people of a working age in 2010. This accounts for 63% of the total population, from which 16 341 was employed (29.4%). Of the working-age population, 52% were male.

Unlike South Africa with a labour participation rate of over 50%, Lephalale labour participation rate was 38.5%. Essentially, just under two thirds of the working age population in Lephalale were non-economically active, a significant portion of whom were discouraged job seekers. Of the economically active population (21 371), 23% were unemployed, which means that it was lower than in the rest of the country. Considering that the labour force participation rate in Lephalale

was smaller than in South Africa, the lower unemployment rate does not necessarily reflect better socio-economic conditions in the municipality compared to the rest of the country. The number of unemployed people in Lephalale increased slightly from 2009 to 2010. A steady drop in labour participation is also evident from 2005 onwards with an average decline of 5.7% per annum (Quantec, 2010). This shows that a greater number of people in the municipality become discouraged job seekers over the years, which also means that the dependency ratio in the area grew.

The employment structure of the economy provides valuable insight into the dependency of an area's income and employment in specific sectors. Knowledge of the structure and the size of each sector relative to employment participation of the labour force in the study area are important when assessing potential economic impacts, as it allows the assessment of the extent to which the proposed activity would change the structure of the economy and trends of specific sectors relative to employment.

The economy is made up of three sectors, each varying in degrees of impact on the local economy and employment structure. It is evident from Table 6 that the tertiary sector creates one out of two employment opportunities in Lephalale compared to about three out of four employment opportunities in the country. Four out of ten jobs in the local area are created by the primary sector. One of the goals outlined in the NDP (2011-2030) is to ensure development of a stable economy. Essentially, a stable economy is less reliant in the primary and secondary sectors than the tertiary sector, as an economy easily affected by trade and global economic spin-offs is unstable. Therefore, an economy dominated by the tertiary or services sector is more desirable as it reduces the risks associated with fluctuations in demand for commodities.

The mining sector creates the largest number of employment opportunities in the area by providing jobs for more than a quarter of workers. It is followed by the agricultural sector that contributes 14% to the local employment. The electricity generating industry is the smallest sector in the area; however, considering the development of the new coal-powered power station its contribution to the local economy's employment is expected to grow in the near future.

According to Quantec (2011), the Lephalale economy lost 7 280 employment opportunities between 2005 and 2010, which represented a 30.8% decline during the analysed period. This means that almost a third of the people employed in 2005 lost their jobs, which again explains the high net out-migration rate observed in the Municipality. Of all three sectors, the secondary sector had the lowest total loss of employment of 957, with the primary and tertiary sectors grossing at over 3 000 each. With regard to the reduction of employment

opportunities, the secondary sector saw a 41% loss, followed by the primary sector with 32% and the tertiary sector with a 27.6% drop in employment (Quantec, 2010).

Over the period between 2005 and 2010, the mining and transport sectors were the only sectors that showed a growth in employment. Together, they created 806 jobs of which most of them were created in the mining sector.

The sector showing the largest loss of employment within the period was the agricultural sector. Between 2005 and 2010 its employment opportunities declined by 3 932, or 63%. Agricultural activities are labour intensive; therefore, a small decline in the size of that sector would generally lead to greater losses of jobs. This is evident when comparing the growth rate for the GVA of the agriculture sector in current prices at 5.7% relative to a colossal loss of employment equating to 63%. Agriculture is historically one of the building blocks of the Lephalale economy. A decline in this sector would most definitely worsen the quality of lives and welfare of the affected households, which would force them to move to areas that offer greater potential to find employment.

Aside from the agricultural sector, industries that experienced a sharp decline in employment were trade and community services. Both of these sectors are reliant on the purchasing power of the local population. Since population in the area has been declining, it also means that the demand for trade and community services was dropping leading to the closure of businesses and subsequently job shedding.

It is envisaged that the development of the Limpopo Coal, Energy and Petrochemical cluster (Lephalale LED, 2008) in the Lephalale LM is expected to reverse the trends observed in the area in the past few years. With the expected development of the mining industry in the area and establishment of new industries, employment opportunities within both the mining and secondary industry are expected to grow. These developments are expected to maximise local economic spin-offs leading to the creation of new employment opportunities in the services sector.

6.13.4. Status of infrastructure and basic service delivery

Access to basic service delivery and infrastructure such as shelter and transport are indicators that assist in understanding the standard of living of the households residing in the study areas. Comprehension of the extent to which households in the area have access to water, sanitation, and electricity assists in the understanding of communities' living standards and their needs. The availability of service infrastructure such as roads, educational and health

facilities etc. further indicates the nature of the study area, which is valuable in developing a complete profile of the circumstances in which communities are living.

6.14. Heritage Profile

The study area is characterised by a featureless flat landscape that falls in an inhospitable environment with low rainfall. The lack of any ephemeral or permanent water sources possibly attributes to the marked paucity of archaeological sites in the study area. Palaeo drainage lines and seasonal pans in the wider study area are known to contain MSA material dating to what is referred to as a Post Howiesons Poort industry. While the Limpopo floodplain to the north was settled by Iron Age communities producing stylistic pottery known as Letsibogo while their herdsmen utilized the calcrete plateau for summer grazing as far as 15 km from the settlements (Huffman & van der Walt 2011). More favourable water rich areas to the south of the study area in the Waterberg was also inhabited by Stone Age communities (Van der Ryst 1998) and later by Iron Age groups producing stylistic pottery known as Eiland as well as Ndebele groups (Aukema 1989; Huffman 2007). Tsetse fly and the lack of good agricultural conditions also meant that the area was sparsely inhabited in the late 1800's and early 1900's.

6.14.1. Palaeontology

There are no visible fossil-bearing strata in the study area. A study to the north west of the study area (Huffman & vd Walt 2008, 2011) found that shale lenses that lay in between coal seams might be of interest to palaeontologists. Their date and type of plant remains in particular need to be determined. It is not known if coal seams occur within the current study area.

6.14.2. Earlier Stone Age

Hominids began to make stone tools about 2.6 million years ago. Known as the Oldowan industry, most of the earliest tools were rough cobble cores and simple flakes. The flakes were used for such activities as skinning and cutting meat from scavenged animals. These early artefacts are difficult to recognise and have so far only been found in rock shelters such as the Sterkfontein Caves (Kuman, 1998); they are unlikely to occur in the study area.

At about 1.4 million years ago hominids started producing more recognizable stone artefacts such as hand axes, cleavers and core tools (Deacon & Deacon, 1999). Among other things these Acheulian tools were probably used to butcher large animals such as elephants, rhinoceros and hippopotamus that had died from

natural causes. Acheulian artefacts are usually found near the raw material from where they were quarried, at butchering sites, or as isolated finds.

No Acheulian sites are on record near the project area, but isolated finds are possible. However, isolated finds have little value. Therefore, the project is unlikely to disturb a significant site. The presence and significance of finds can be determined by a field investigation.

6.14.3. . Middle Stone Age

By the beginning of the Middle Stone Age (MSA), tool kits included prepared cores, parallel-sided blades and triangular points hafted to make spears (Volman, 1984). MSA people had become accomplished hunters by this time, especially of large grazing animals such as wildebeest, hartebeest and eland.

These hunters are classified as early humans, but by 100,000 years ago, they were anatomically fully modern. The oldest evidence for this change has been found in South Africa, and it is an important point in debates about the origins of modern humanity. In particular, the degree to which behaviour was fully modern is still a matter of debate. The repeated use of caves indicates that MSA people had developed the concept of a home base and that they could make fire. These were two important steps in cultural evolution (Deacon & Deacon, 1999). Accordingly, if there are caves in the study, they may be sites of archaeological significance.

MSA artefacts have been found in the Oliboompoort Cave to the south of Lephalale (Mason, 1962; M. van der Ryst, 2006) and in the river gravels of the Limpopo, northwest of the project area (Pistorius, 2007). A large scale survey 0f almost 9000ha in 2011 by Huffman and vd Walt found that Middle Stone Age sites were associated with pans and ancient drainage systems throughout the project area. It is assumed that same scenario will repeat itself in the current study area especially around large and prominent pans like Eendragpan on the farm Gelykebult.

6.14.4. . Later Stone Age

By the beginning of the Later Stone Age (LSA), human behaviour was undoubtedly modern. Uniquely human traits, such as rock art and purposeful burials with ornaments, became a regular practice. These people were the ancestors of the San (or Bushmen). San rock art has a well-earned reputation for aesthetic appeal and symbolic complexity (Lewis-Williams, 1981). There is a single known rock art site (S23.65132 E27.58651 in the project area, on

Nelsonskop 464 LQ to the east (Pistorius, 2007, van Schalkwyk 2011). The preferred transmission line option traverses close to this site.

In addition to art, LSA sites contain diagnostic artefacts, including microlithic scrapers and segments made from very fine-grained rock (Wadley, 1987). Spear hunting probably continued, but LSA people also hunted small game with bows and poisoned arrows. Important LSA deposits have been excavated in Oliboompoort Cave (Mason, 1962) and other sites in the Waterberg to the south (Van der Ryst, 1998). Sites in the open are usually poorly preserved and therefore have less value than sites in caves or rock shelters. If there are rock shelters or caves in the study area, they may contain LSA sites of significance.

6.14.5. . The Iron Age (AD 400 to 1840)

Bantu-speaking people moved into Eastern and Southern Africa about 2,000 years ago (Mitchell, 2002). These people cultivated sorghum and millets, herded cattle and small stock and manufactured iron tools and copper ornaments. Because metalworking represents a new technology, archaeologists call this period the Iron Age. Characteristic ceramic styles help archaeologists to separate the sites into different groups and time periods. The first 1,000 years is called the Early Iron Age.

As mixed farmers, Iron Age people usually lived in semi-permanent settlements consisting of pole-and-daga (mud mixed with dung) houses and grain bins arranged around a central area for cattle (Huffman, 1982). Usually, these settlements with the 'Central Cattle Pattern' (CCP) were sited near water and good soils that could be cultivated with an iron hoe. For the project area, archaeological sites such as these are unlikely to occur except along river terraces.

Archaeologists have not yet resolved the role of a special pottery, known as Bambata, in the spread of pastoralism and mixed farming (Huffman, 2007). Some believe that Bambata pottery represents the vanguard of the Early Iron Age, or alternatively, Khoe pastoralists, while others believe it was acquired by LSA people through trade. This pottery has been found at Oliboompoort in LSA deposits (Mason, 1962; Van der Ryst, 2006) and is thus believed to exist in the general region.

Some Iron Age settlements are on record for the general area, for instance alongside the Matlabas River (Aukema in Huffman, 1990) and in Botswana (Biemond, 2005) and south of the Limpopo close to Steenbokpan (Huffman & vd Walt 2011). These sites are ecognized by distinctive pottery known as the

Letsibogo facies of Moloko (Huffman, 2007). It is possible that some Moloko sites could lie within the project area.

The Little Ice Age began at about AD 1300, and its impact on farming societies was particularly severe. Another major drought occurred at about AD 1650, and it is unlikely that Iron Age people lived in the project area at these times.

6.14.6. Cultural and Historic

Voortrekkers crossed the Vaal River in 1836, and within a few years, began to spread north. Much of the Limpopo Province contained tsetse fly, and so early Boer farmers didn't settle immediately in the area. European settlement of the region began at the beginning of the last century. Some of the first settlers, D.P. van der Westhuizen and C. Ricks, both arrived in about 1901. The study area is close to the ox-cart route to Botswana that crossed the Limpopo a few kilometres upstream from the modern border post. Some of pans were used as outspans along the route. Because the area was not suitable for grain agriculture, African farmers did not live in the area, and labour had to come from far afield. Rather the area was used primarily for hunting. Even now, the general region is a big-game area (Huffman & vd Walt 2011).

6.14.7. Sites identified within the Study area

The project area is not void of heritage sites and the remains of two ruins possibly dating to the late 1950's based on dates from a grave (refer to Table 6.2) next to one of the ruins occur on the area investigated for the footprint of the power station (the farm Onbelyk). A single kopje known as Nelsonskop on an otherwise featureless landscape has engravings on the southern face of the kopje with ephemeral stone walls on top of the hill. The transmission line alternatives 2 & 3 traverses close to the site (refer to Table 6.3).

Table 6.2: Ruin 1 and 2 (demolished foundations)

Site Number	Ruin 1 and 2	**1:50 000 map nr**	2327 CB
Site Data	**Description:**		
Type of site	Open site		
Site categories	Recent/historical ruin		
Context	**Ruin 1** consists of the demolished remains of a dwelling with 4 rooms. The building was constructed with clay bricks and is possibly a farm labourer dwelling. Associated with the site is a water dam and water tank. **Ruin 2** is a much larger setup and was		

	possibly the old farm house. The site is also totally demolished and the only remains are rubble of clay and modern bricks. Both sites will be directly impacted on by the proposed power station footprint. It must be kept in mind that sites like these might contain unmarked graves.
Cultural affinities, approximate age and significant features of the site;	Based on the date of the associated grave the structures are possibly younger than 60 years.
Estimation or measurement of the extent	Ruin 1 covers an area of 5x6 meters. Ruin 2 covers an area of 10x12 meters.
Description of artefacts	Modern industrial artefacts, such as wire, glass and cans, are scattered over the sites.

Photographs

Cement foundations at ruin 1.

General Site conditions at ruin 1.

Demolished remains of house at ruin 2.

Cement and brick foundations of waterhole at ruin 1.

Field Rating (Recommended grading or field significance) of the site:	Generally Protected C
Statement of Significance (Heritage Value)	The sites are of low heritage significance.

Table 6.2: Grave

Site Number	Grave	**1:50 000 map nr**	2327 CB
Site Data	**Description:**		
Type of site	Open site		
Site categories	Grave located outside of a formal cemetery		
Context	The site consists of one visible grave of Hendrik Johannes van Wyk who passed away in 1959. The site is fenced with an access gate but the remains of a larger boundary fence are still visible around the grave and it is possible that other unmarked graves might be present. The site is located on the periphery of the power station footprint and a secondary impact is foreseen on the site.		
Cultural affinities, approximate age and significant features of the site;	The grave dates from 1959 as per the headstone inscription.		

Photographs

Grave viewed from the south east.

Granite headstone.

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 IPP Thabametsi Power Station. This assessment is undertaken for all the phases of the project's development and for all the facility's components which will comprise:

» Access roads within the project locality boundaries, and upgrading and tarring of the existing provincial road from the current gravel transition point to the Power Plant. The upgrade of the existing District road D2001 is planned and will entail tarring of the road.
» Coal Stockpile area (sized for a ~30-days capacity of ~700,000 tonnes) and overland conveyors from Thabametsi Mine, with transfer house battery-limit situated at boundary with Thabametsi Mine, to Power Plant.
» Raw-Water Storage Dam, Pump-stations and Reservoirs.
» Coal stockyard loading and offloading facilities, adjacent to Power Island.
» Power plant production areas (including Power Island Units/s and Balance-of-Plant, offices, operations, logistics and maintenance area/s).
» Water and Waste-Water Treatment facilities, adjacent to Power Island.
» Engineered Ash disposal facilities and overland conveyors (~5-km^2 in extent).
» Pollution and Storm-water Control Facilities and Dams
» An HV-Yard and Substation, adjacent to the Power Plant.
» Overhead power lines to connect into the Eskom grid. Three 400-kV overhead lines are proposed which require a servitude 165m wide and will be ~ 43-km in length (depending on the final route selected). The power generated is planned to be evacuated into the electricity grid at a point to be determined in consultation with Eskom.

It should be noted that the potential impacts associated with the water supply pipeline and the coal conveyors from the Thabametsi Mine are addressed within a separate process being undertaken for the Thamabetsi Mine.

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 from the secured supply and water treatment; operation of the facility and the generation of electricity; deposition of ash on ash dump; 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. Areas of sensitivity identified during the Scoping Study

Issues of potential environmental concern identified through the scoping phase include the following:

» Air quality impacts from the proposed power station due to emissions, potentially of very high significance requiring extensive mitigation.
» Cumulative air quality impacts due to existing power stations and other mining and industrial activities in the area.
» Contaminated storm water run-off from the coal storage stockyard and contaminated runoff from the ash dump.
» The cumulative visual impact of the proposed power station in context of the existing concentration of industrial infrastructure, with specific reference to the Matimba Power Station, the Medupi Power Station, the Grootegeluk Coal Mine, the future Thabametsi, Resgen and Sekoko Coal Mines. Visual Impact of the general aesthetics of the area's landscape, and on the intrinsic value and sense of place.

An environmental sensitivity map (based on desktop findings) is shown in Figure 7.1. Issues of environmental sensitivity identified to date within the study area include the following:

» Two noise sensitive receptors;
» Rivers / tributaries of rivers and wetlands;
» Areas of medium-high and medium flora and faunal sensitivity (including protected tree species that occur on the site); and
» Settlements in close proximity the site (such as Maropong, Overweracht and Lephalale).

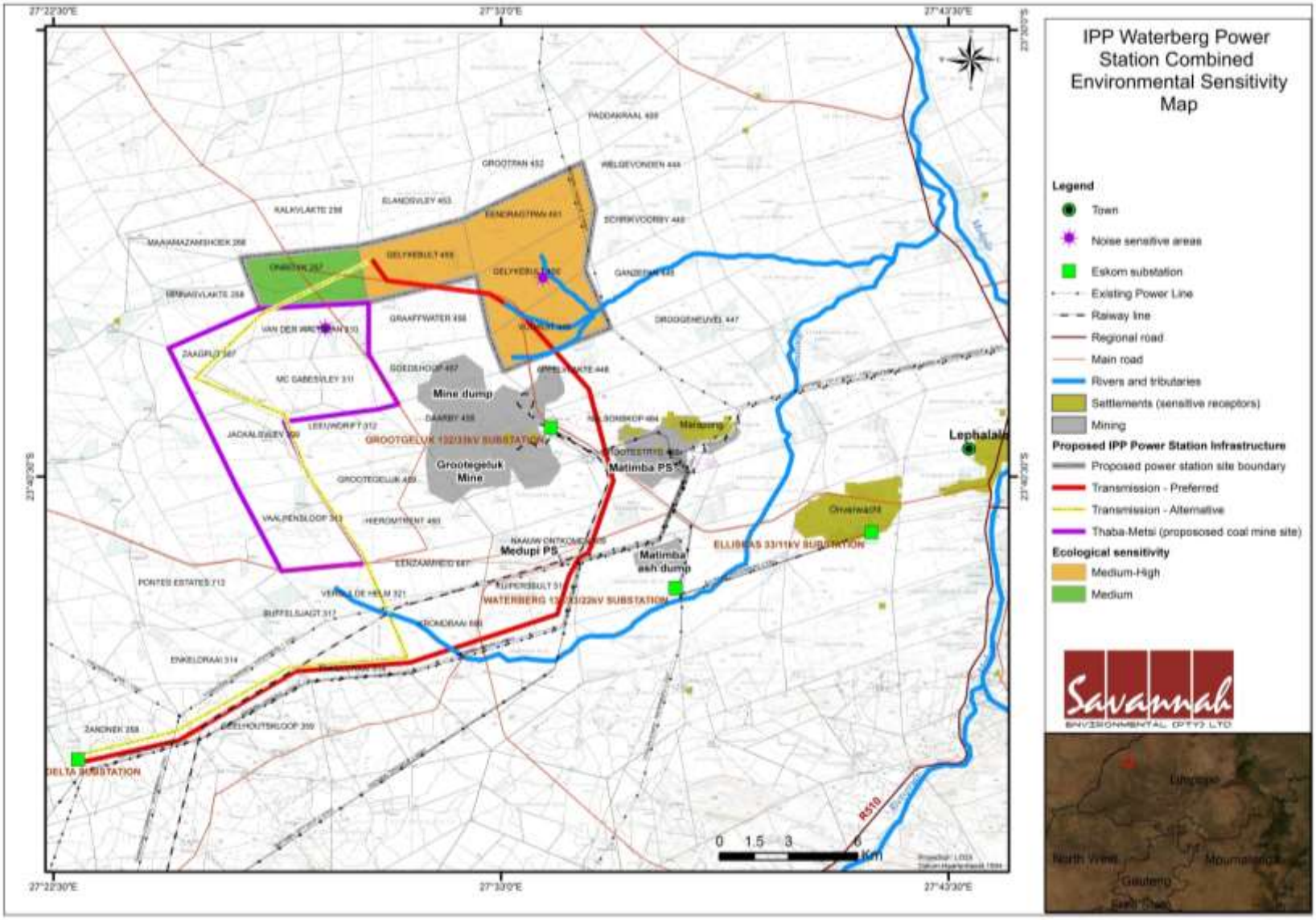


Figure 7.1: Combined Environmental Sensitivity Map for the Proposed IPP Waterberg Power Station developed from the scoping phase studies

These and other environmental issues have been assessed during the EIA Phase. The sensitivity map produced from the Scoping Phase of the EIA Process has been updated to include sensitivities identified through the detailed field studies (refer to Figure 7.2).

7.2. Methodology for the assessment of potentially significant impacts

A broader site of approximately 55km^2 comprising 5 farms (Onbelyk 257 LQ, Gelykebult 455 LQ, Gelykebult 450 LQ, Eendragtpan 451 LQ, and Vooruit 449 LQ) was evaluated within the scoping study for the purpose of establishing the proposed IPP Thabametsi Power Station. Following the Scoping Phase of the EIA Process, it was concluded that the farm Onbelyk 257 LQ was preferred based on environmental sensitivity of the area (as shown in Figure 7.1) and technical constraints. This assessment therefore only considers potential environmental impacts associated with the development of the proposed power station on this farm portion. In addition, through the scoping study, it was determined that the preferred power line alternative was that following the Mmamabula-Masa power line alignment due to technical constraints associated with the alternative route investigated. Therefore, this route, together with two deviations from this route connecting to alternative points on the electricity grid, were considered within this assessment (refer to Figure 7.3).

The assessment of potential issues has involved key input from specialist consultants, the project developer, 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 for consideration by the specialist consultants (refer to Appendix A). In terms of this proposed layout, the footprint of development associated with the proposed project is expected to be as follows:

» Power Plant - 50ha;
» Ash Dump – 500ha (extending over a 40-year period);
» Strategic Coal Stockpile - 100ha (providing for a stockpile for 30 days); and
» Raw-Water Dam - 2ha.

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
» Solid waste disposal

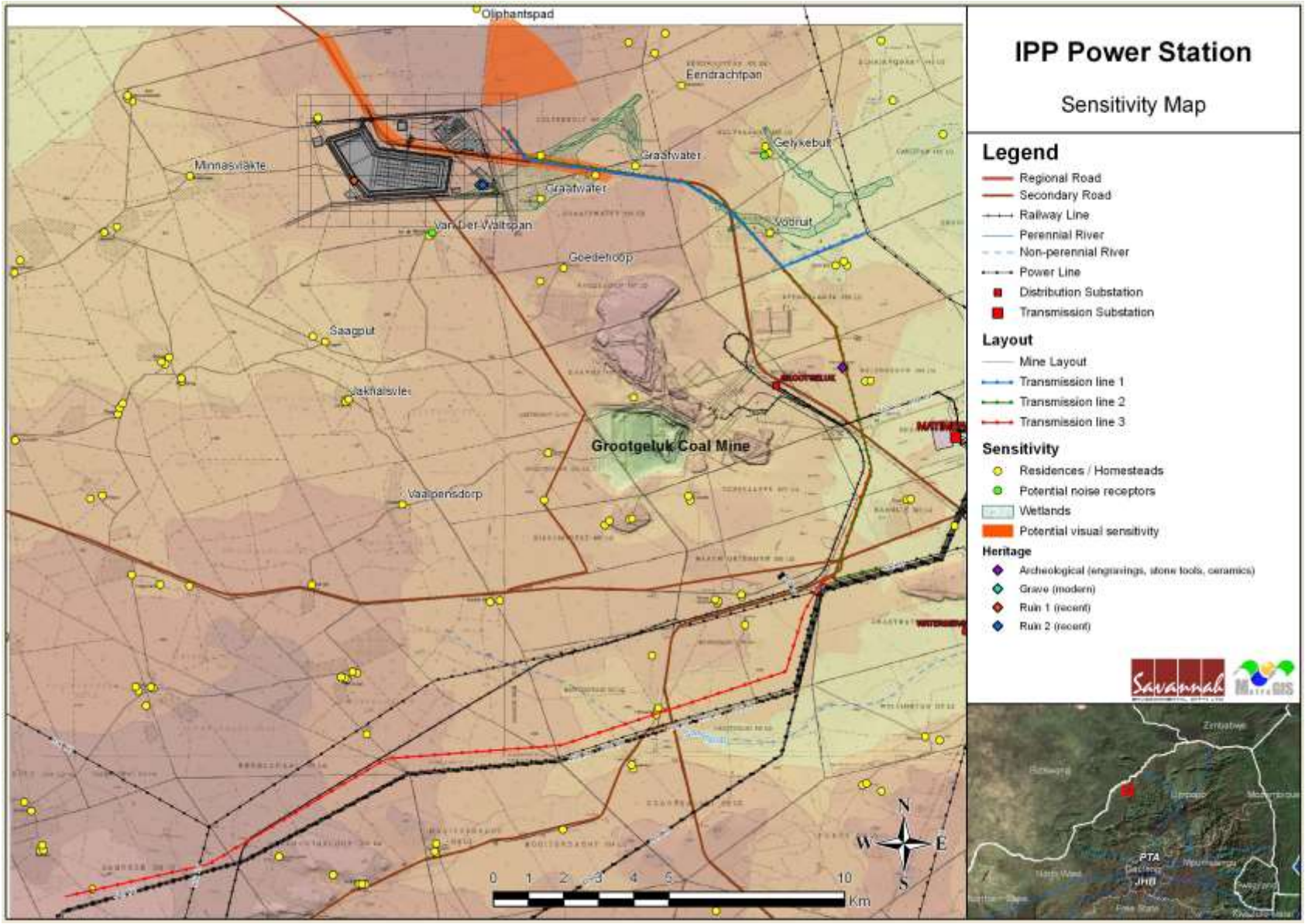


Figure 7.2: Sensitivity map

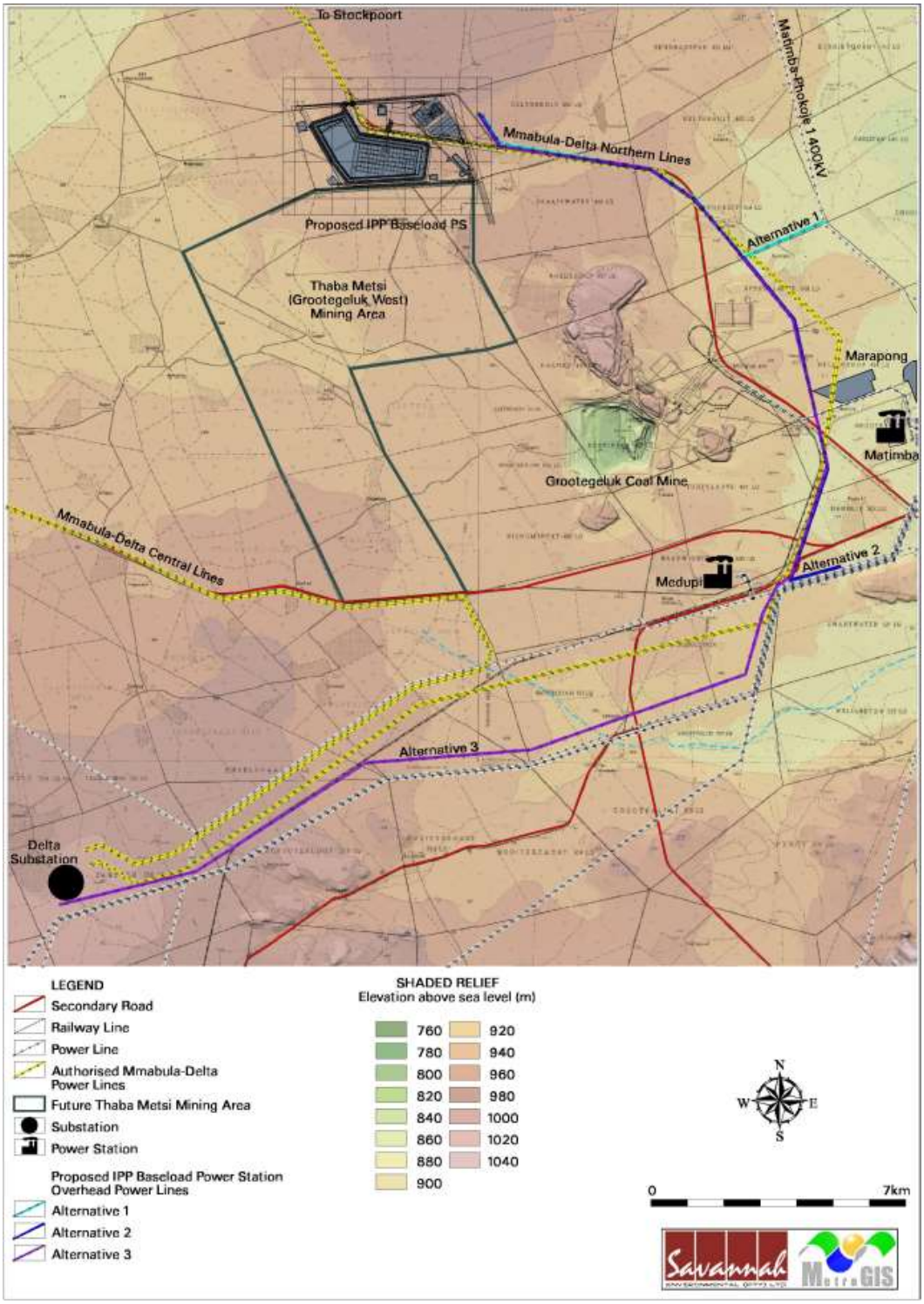


Figure 7.3: Locality map indicating the proposed location of the power station and power line alternatives

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.

7.3.1. Potential Impacts on Ecology

i) Results of Impact Assessment

Flora:

Vegetation of the study area displays a remarkable homogeneity in terms of species composition as well as structural aspects. A dominant tree layer is augmented by a diverse shrub layer. The grass sward and herbaceous layer exhibit similar characteristics of homogenous composition. The vegetation of the proposed site is representative of the regional vegetation, while the homogenous nature is typical of areas that are characterised by low variation in biophysical attributes. No floristic attribute of particular sensitivity was observed during the survey period. However, the presence of protected tree species is noted across the entire site. This is typical of the larger region. No Red Data flora species were recorded during the survey period. Furthermore, habitat within the proposed site is not regarded particularly suitable for any Red Data plant species that is likely to persist in the region, although protected trees were confirmed on the site. The homogenous nature of the vegetation, the absence of Red Data species as well as the absence of peculiar or unique floristic habitat types render most of the site medium in terms of floristic sensitivity (refer to Figure 7.1).

Small, localised variations are associated with anthropogenic activities, such as bush clearances, which has subsequently stabilised, displaying a secondary climax status dominated by sclerophyllous *Acacia* species and a poor herbaceous composition and grass sward. Similarly, piospheres, representing atypical vegetation that developed around permanent (artificial) watering points represent localised areas of atypical vegetation. These areas, because of a slightly degraded nature, exhibit attributes of medium-low floristic sensitivity (refer to Figure 7.1).

Fauna:

The study area is characterised by (largely) untransformed savanna habitat that includes the Sweet Limpopo Bushveld and Western Sandy Bushveld ecological types. Although some transformation is evident, particularly within the proposed power line corridors and in the general surrounds of the industrial type developments of the larger region, most of the original faunal habitat of the study area is still ecologically intact and well represented within the study areas. The presence of 98 animal species in the study area (recorded during the April 2013 field investigation) attests to the untransformed nature of the faunal habitats. The ecological functionality, integrity, faunal biodiversity and general sensitivity of the study area is underlined by the confirmed presence of three Red Data species in the study area as well as the confirmed presence of eighteen Red Data species in the immediate vicinity (historic surveys).

The region in which the study area is located has been significantly altered (the presence of Grootegeluk opencast coalmine, Matimba and Medupi (under construction) power stations and associated infrastructure) and continues to experience very high land use change pressures. Consequently, the general sensitivities of faunal habitats and faunal communities of the region in which the study area is located, increases almost on a daily basis.

Additionally, the habitat loss (and fragmentation) thresholds of the sensitive faunal inhabitants of the study area region (eighteen Red Data species confirmed) are mostly unknown and warrant caution. Habitat contained within the farm Onbelyk is not regarded particularly sensitive in terms of faunal attributes and the proposed development, albeit likely to result in significant and, typically, severe impacts on a local scale are unlikely to register similar significance on a larger scale. The loss of these areas is unlikely to result in significant impacts on a specific species or affect the conservation status of any particularly species significantly. Habitats types encountered within the farm Onbelyk are adequately represented on local and regional scale and the loss expected to result from the proposed development is similarly unlikely to affect the conservation status of these habitat types on a local and regional scale.

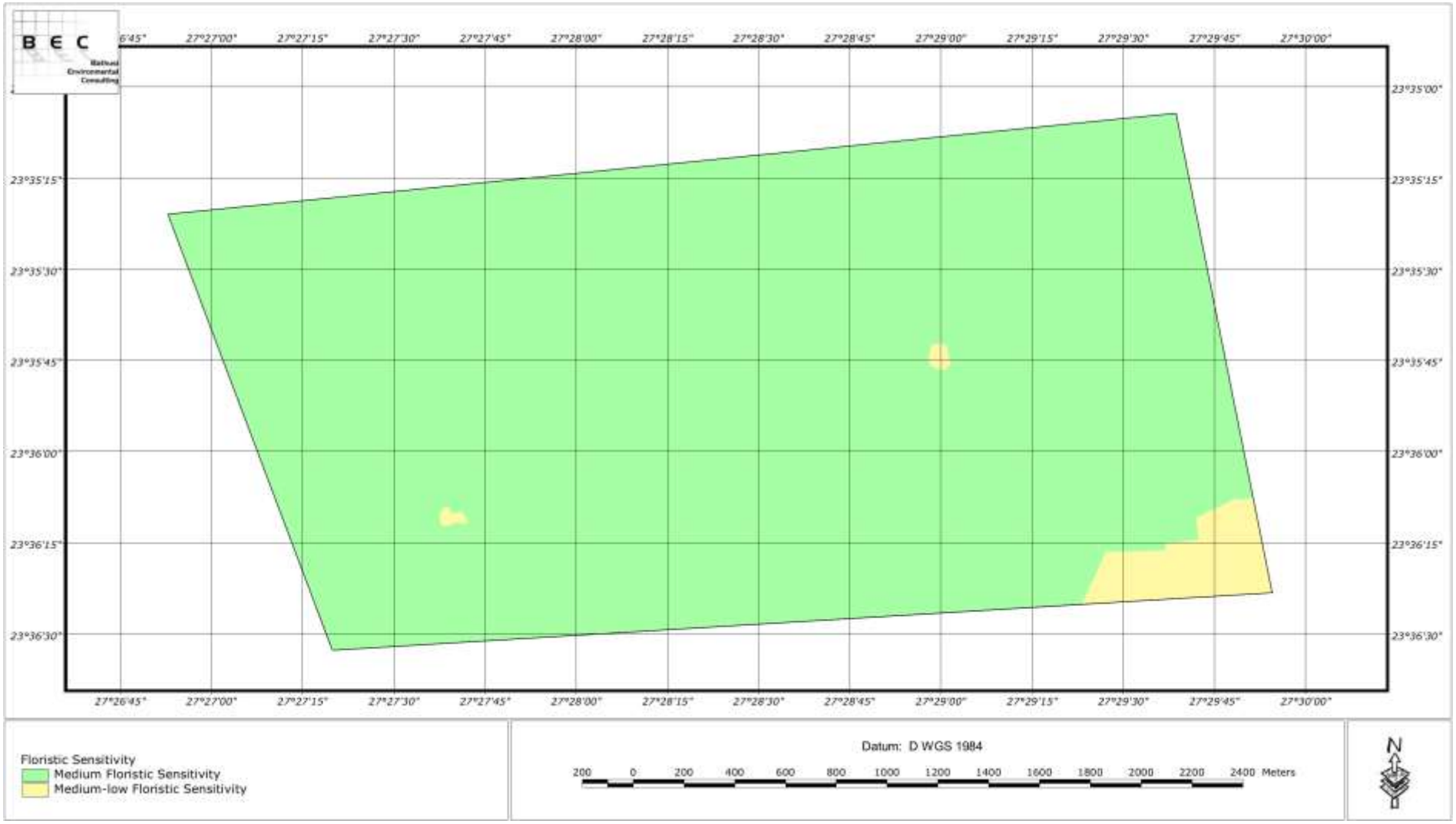


Figure 7.1: Floristic/ Faunal/ Ecological Sensitivity of the Farm Onbelyk

Power Line:

The estimated floristic sensitivity of the macro-habitat types within the power line corridors is considered to be moderate for most of the length of the power line route alternatives (as illustrated in Figure 7.2). Protected trees occur throughout the region and the length of the proposed alternative therefore will directly reflect the severity of the impact on protected trees.

ii) 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 currently in a climax (natural) status.

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.

In contrast, indirect impacts are not immediately evident and consequently cannot be measured at a specific moment in time. The extent of these impacts is frequently at a scale that is larger than the actual site of impact. A measure of estimation is therefore necessary in order to evaluate the importance of these impacts.

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

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 biophysical report contained in **Appendix F**.

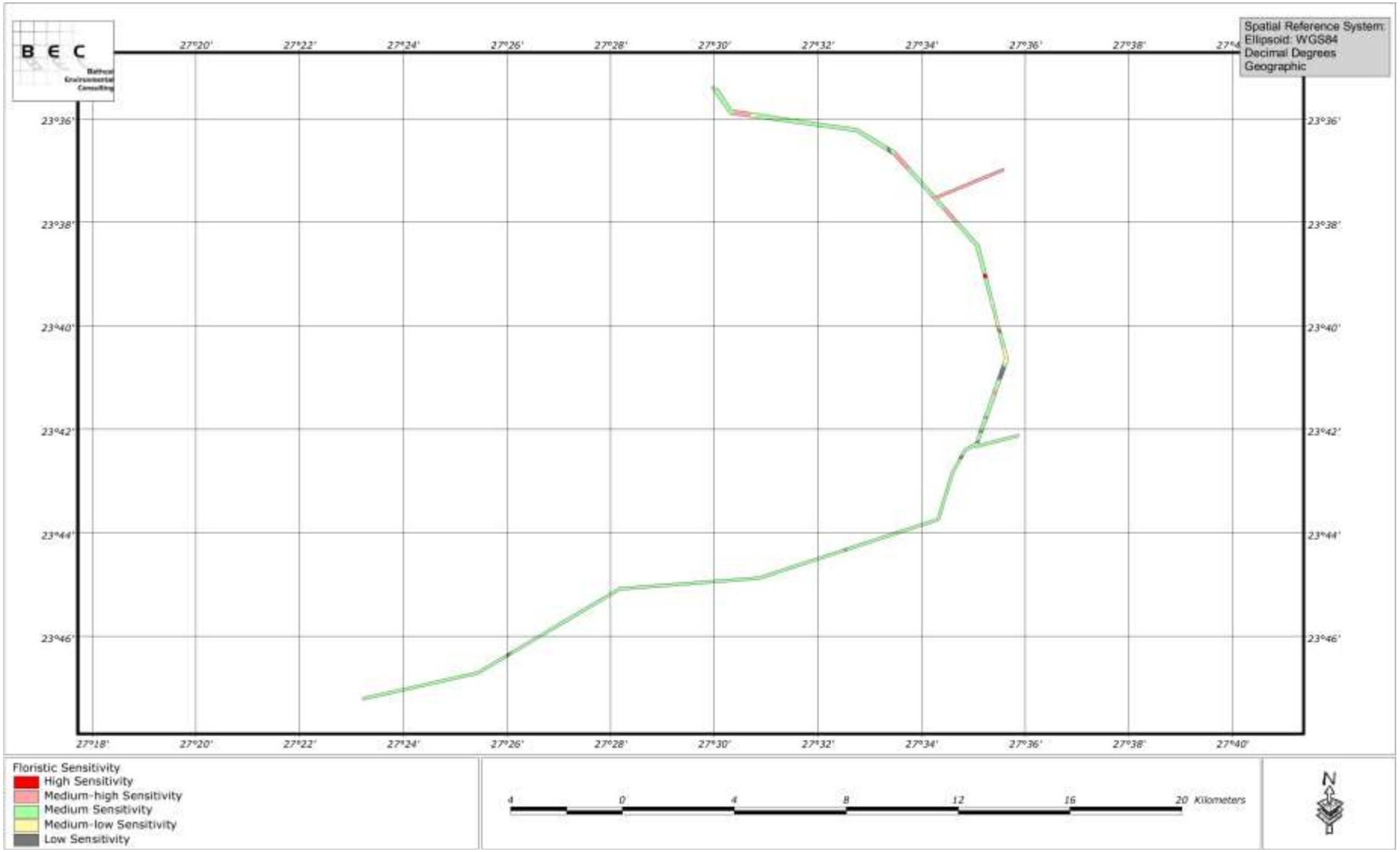


Figure 7.2: Floristic/ Faunal/ Ecological Sensitivity of the proposed power line corridors

Table 7.1: Summary of impacts on Flora, Fauna, and Ecology (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Impacts on flora species of conservation importance (including individuals, communities & suitable habitat) – mainly related to protected trees	High to Medium (negative)	Medium (negative)	Continued loss of protected species on a local and regional scale is experienced due to increase in local developments. Invasive and encroacher species that could populate development areas may pose a threat to surrounding natural habitat where protected species persist	Sterile landscapes with fragmented and isolated portions of remaining natural habitat, continual decline in habitat availability, status and population numbers
Impacts on fauna species of conservation importance (including suitable habitat)	High (negative)	Medium (negative)	Loss of habitat suitable for foraging and migration of animals of conservation importance	Increase in habitat fragmentation and isolation, disruption of migration corridors
Displacement of fauna species, human-animal conflicts & interactions	High to Medium (negative)	Medium (negative)	Loss of habitat suitable for foraging and migration of animals of conservation importance	Increase in habitat fragmentation and isolation, disruption of migration corridors
Impacts on ecological connectivity & ecosystem functioning	High to Medium (negative)	Medium (negative)	Habitat loss, degradation, fragmentation & isolation of natural habitat	Fragmented, isolated portions of natural habitat, sterile landscapes
Indirect impacts on surrounding habitat from construction and operational activities (due to habitat fragmentation, pollution, etc.)	Medium to Low (negative)	Low (negative)	Loss of natural habitat, habitat fragmentation and degradation	Increase in habitat fragmentation and isolation, loss of natural habitat
Cumulative impacts on conservation obligations & targets (including national and regional)	Low (negative)	Low (negative)	Loss of natural habitat, habitat fragmentation and degradation	Increase in habitat fragmentation and isolation, loss of natural habitat
Cumulative increase in local and regional fragmentation/ isolation of habitat	Medium (negative)	Low (negative)	Loss of natural habitat, habitat fragmentation and degradation	Increase in habitat fragmentation and isolation, loss of natural habitat

iii) Comparison of Alternatives

The disparity between the length of the proposed corridors and the extent of natural woodland habitat that will ultimately be affected by the construction and operational activities generally determines the suitability of the respective alignments. Protected trees occur throughout the region and the length of the proposed alternative therefore will directly reflect the severity of the impact on protected trees. To a lesser extent, the presence of a highly sensitive habitat type (Rocky Outcrop) within Preferred Options 2 and 3 further detracts from the suitability of these alignments from a flora perspective.

Effects from the construction and development of the proposed power lines on fauna and faunal habitats will vary significantly within the respective power line alignment options. The loss of natural woodland habitat is likely to affect the faunal component significantly in direct relation to the increase in length of the power lines. Since habitat types and sensitivities of the respective line variants are largely similar, the extent of habitat loss largely determines the preference ascribed to the power line alternatives.

The preference ranking for the proposed corridors in terms of flora, fauna and ecological considerations is therefore:

» **Option 1 Most preferred/ Suitable;**
» Option 2 Moderately suitable; and
» Option 3 Least preferred/ Not suitable.

iv) Mitigation Measures

The implementation of generic mitigation measures are expected to result in limiting potential and likely impacts on the floristic environment to acceptable significance. The following measures are recommended for identified impacts:

» Extent of impact should be limited to site only.
» Avoid impacts in adjacent areas through the implementation of a monitoring programme and mitigation measures that are aimed at identifying and preventing the uncontrolled spread of impacts into adjacent areas of natural habitat.
» Provide an adequate buffer between areas of development and surrounding natural habitat.
» Selected species and individuals should be rescued and replanted at suitable localities, specific reference to required landscaping and rehabilitation of development areas.

- » Investigate the potential for limited vegetation removal, with particular reference to protected species.
- » Removal of vegetation/ plants shall be avoided until such time as soil stripping is required and similarly exposed surfaces must be re-vegetated or stabilised as soon as is practically possible
- » Capture and relocation programmes to be implemented for faunal species.
- » No animal may be hunted, trapped, snared or captured for any purpose whatsoever.
- » Develop and implement biodiversity monitoring programmes.
- » Conduct a protected species survey prior to the commencement of construction activities. Results of this survey will guide permitting requirements for the removal of protected trees from the selected property. It is important to note that all required permits should be obtained prior to the commencement of construction.
- » Develop and implement alien and invasive management programmes.
- » Prevent contamination of any natural habitat and nearby wetlands from any source of pollution
- » Personnel awareness regarding minimisation of impacts to habitats and faunal species in the area.
- » Human movement and involvement across the development site and adjacent areas should be limited as far as possible.
- » Implement suitable procedures in the event of encountering potentially dangerous animals on the site
- » Identify and implement a rehabilitation programme that makes use of locally endemic species

v) Conclusions and Recommendations

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, 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 (appurtenant infrastructure) because of the development will result in significant, but localised, impacts on the natural environment. While a significant impact is expected on the protected trees that occur on the site, the conservation status and regional abundance of these species are not expected to be affected

on a local or regional scale. Similarly, animals could potentially be affected severely, but the mobility of most species that are of conservation concern, renders the probability of this impact unlikely.

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, 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.

7.3.2. Potential Impacts on Wetlands

i) Results of Impact Assessment

The project area is located in close proximity to the Grootegeluk Coal Mine as well as the Matimba Power Station. The project development area is currently used as a game reserve and therefore no major infrastructure development has taken place. Wetland units located along the power line routes and within the project site were identified through desk-top studies and field surveys. The wetland areas were delineated in accordance with the DWAF (2005) guidelines, whereby features such as soil, vegetation and topography were considered. The delineated wetland areas, together with recommended buffer zones[11] required to minimise impacts on these systems are illustrated in Figure 7.3. The identified wetland units include:

- Non-perennial pans;
- Wooded drainage lines:
  - Valley bottom with a channel; and
  - Valley bottom without a channel

[11] Buffer zones are a requirement in order to facilitate the protection of the delineated wetland areas within the project area and to minimise the anthropogenic impacts associated with the proposed development on the receiving water resources. A buffer zone is defined as: "*the strips of undeveloped, typically vegetated land (composed in many cases of riparian habitat or terrestrial plant communities) which separate development or adjacent land uses from aquatic ecosystems (rivers and wetlands).*"

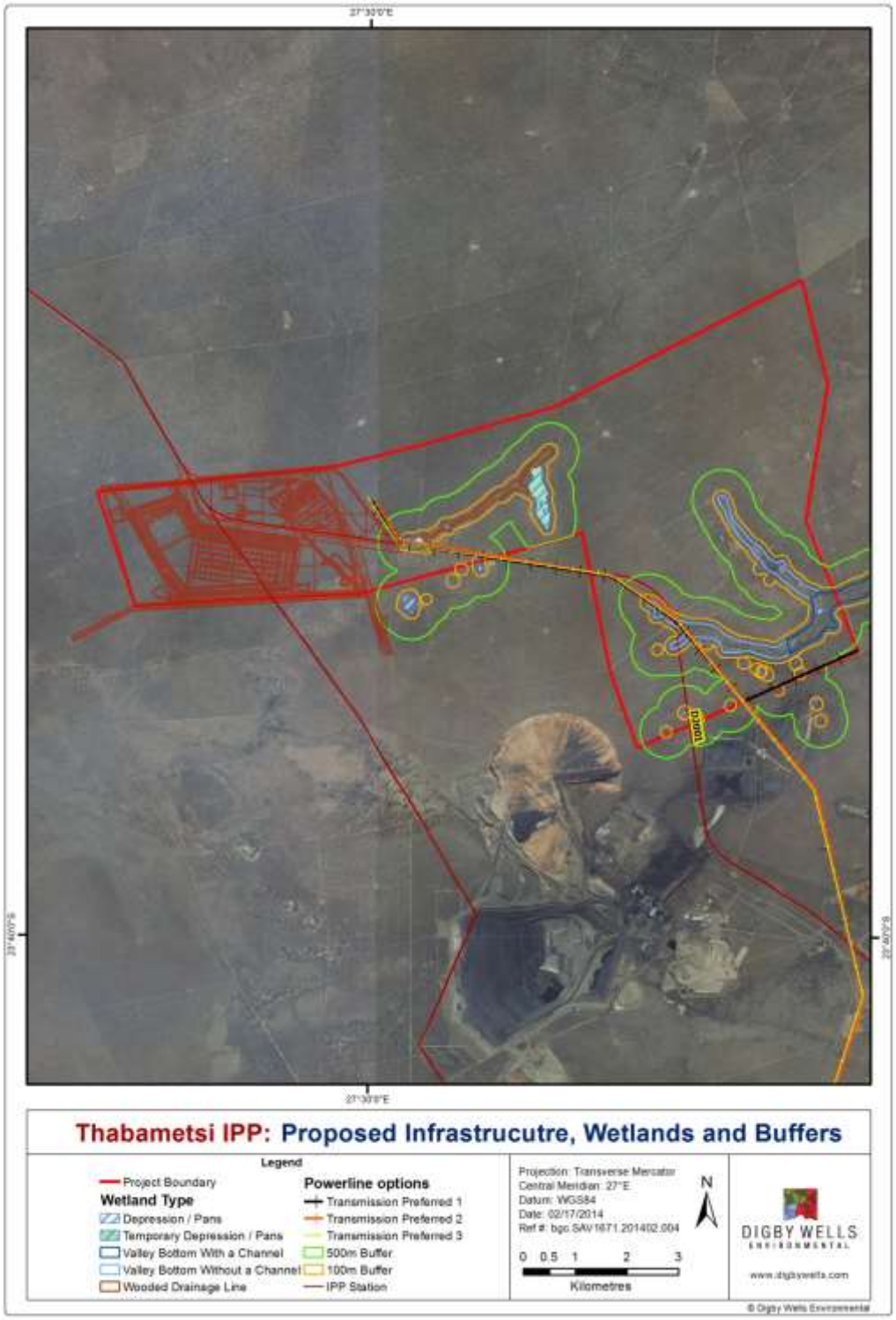


Figure 7.3: Delineated wetland areas within the project area, the proposed infrastructure and the appropriate wetland buffer zones

Pans within the project site were in a good general ecological state. Furthermore, the condition of pans was consistent throughout the site and the major impacts were ubiquitous. For this reason, pans were grouped together in order to determine their overall integrity score. Some of the existing impacts identified within the project area during the site investigations include:

» Overgrazing and trampling by game due to overstocking;
» Presence of hardened surfaces which will result in increased runoff and reduced infiltration by wetlands (bird hides, roads, structures);
» Erosion around wetland areas; and
» Artificial filling of pans with pumps.

The above-mentioned impacts have resulted in the deviation of the integrity of wetland areas within the project area from an un-impacted reference state to the current state.

Infrastructure associated with the proposed power station will encroach onto the buffer zone of wetlands on site. All three proposed power line routes will cross on wetlands in the area. Impacts on wetland areas may result during construction and during operation.

ii) Summary of Impact Assessment

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

iii) Comparison of Alternatives

Based on the assessment conducted and the opportunity to mitigate the impacts to wetland systems the **preferred option would be Transmission Line 1**, as this power line route covers the shortest distance, thus less environmental impact, as the other alternatives transverse further distances (potential larger impacts as more land would need to be cleared). In addition to this the shorter route would reduce expenditure cost and less land owner negotiations would be required. Transmission Line 2 then 3 would then be considered as the next best options if Transmission Line 1 route was not selected.

Table 7.2: Summary of impacts on Wetlands (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Impacts on drainage paths and possible increase in erosion potential as a result of the removal of topsoil and vegetation within wetland buffer areas during the construction of the transmission lines and associated IPP Power Station – resulting in downstream sedimentation and loss of ecological services provided by the system	Medium (negative)	Low (negative)	As the area has been earmarked for development the cumulative impact associated with area on wetland ecosystem would be considered as moderate to high. As mines develop in the areas there is the potential risk that large areas of land could be impacted upon if the appropriate mitigations measures are not implemented correctly.	After mitigation the residual impact of the proposed project is low as there is the opportunity to avoid some of the pans with a slight alteration of the placement of site infrastructure and power line route.
Sedimentation of wetland areas during operation as a result of erosion resulting from stormwater run-off from the power station infrastructure and the ash dump	Medium (negative)	Low (negative)	As more power stations develop in the area more ash will need to be stockpiled. The risk associated with erosion from ash dumps and this impacting other wetland systems would be considered to be moderate.	With the appropriate mitigation measures implemented, this impact would be considered to be low.
Erosion and mobilisation of ash from the ash dumps during operation may result in the deposition of extra sediment into the wetlands, resulting in impacts on water quality.	Medium (negative)	Low (negative)	Further development in the area will result in larger alteration to the landscape. As areas are cleared, more surfaces will become exposed resulting in further erosion and loss of topsoil. As development progresses and more supportive infrastructure are built, such as roads more hardened surfaces will be created. This impact is considered to be moderate.	There would be some residual impact that would remain post mitigation, however this is considered to be minor for the project site when comparing this impact to other developments, such as open cast mine development, where offsets may need to be considered if there is direct destruction of impacts, which may not be the case for this proposed project.
Impacts on ecological functioning of wetlands as a result of leakage from pollution control dams due to ineffective management and poor maintenance of this infrastructure during operation.	Medium (negative)	Low (negative)	Further development in the area may result in degradation and potential increase of release of pollution into these systems. The cumulative impact would be considered to be moderate to high.	After mitigation, this risk may still occur, however is considered to be low if the appropriate maintenance is undertaken.
The demolition and removal of infrastructure may result in impacts to water quality through spillages and leaks. These spillages and leaks may be considered for infrastructure such as	Low (negative)	Low (negative)	The cumulative impact for spillages is dependent on the magnitude of the spillage and the likelihood and the proximity of the spillage to a water resource, such as a wetland. The cumulative impact, taking into	With the appropriate mitigations measures implemented this impact would be considered to be very low

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
sewerage handling facilities, workshops, offices, spent consumables storage, chemical storage facilities, etc.			account other developments would be considered to be a low to a moderate.	
The replacement of soils in the correct soil profile formation during rehabilitation activities would aid in restoring surface flow dynamics for the system. The restoration of surface flow dynamics may result in wetland areas being re-established and supported by surface and sub-surface flow.	Medium (positive)	Medium (positive)	Rehabilitation of other developments in the area, after decommissioning will be a high positive cumulative impact.	None.

iv) Mitigation Measures

The following mitigation measures are recommended in order to minimise the impacts identified as detailed above:

- Limit erosion of exposed areas and stockpiles as well as sediment load reporting to wetlands:
  - Redesigning of surface infrastructure to keep the footprint of the disturbed area to the minimum and designated areas only.
  - Vegetate and wet stockpiles to limit erosion.
  - Berms created below the piles to trap particles and runoff from the stockpile.
  - Allow transmission lines to span over pans and associated channels instead of placing pylon footprints with in pan and channel footprints
- Limit the destruction of the pan catchment area.
  - Removal of vegetation during stripping and dump operation will be minimised to reduce the risk of the exposed surfaces resulting in the increased risk of erosion.
- Limit the wetland areas where soil compaction takes place.
  - Construction servitudes should be kept outside of the delineated non-perennial pan wetland areas and these servitudes should be as narrow as possible to minimise the area affected by soil compaction.
  - Areas that have been compacted should be ripped to break up the compacted soil.
- All construction activities to be planned and managed to ensure that there will not be a dramatic reduction in catchment size and water reporting to the wetland.
  - The non-perennial pan catchment areas should be regarded as sensitive areas and minimum activity should take place in these areas.
- Prevent surface water contamination with hydrocarbons, contaminated water and waste.
  - Hydrocarbon storage facilities, contaminated water storage areas and waste storage facilities should be located outside of the delineated non-perennial pan wetland areas as well as their immediate catchment areas.
- Restore the natural surface and sub-surface flow dynamics of the system during rehabilitation.
  - Soils are to be replaced in the original soil profile.
  - Soils are not to be compacted too much, in order to allow interflow for the system.
- Restore the surface flow dynamics to the catchment during rehabilitation.
  - Restore the topography of the catchment to represent as close to possible the original topography of the catchment

v) Conclusions and Recommendations

The proposed Thabametsi IPP Power Station and associated infrastructure may results in direct and indirect impacts on pans and associated channels and the associated biodiversity within the project area. Biodiversity maintenance and support was determined as the service of high importance associated with the non-perennial pans within the project area. Indirect impacts to non-perennial pans may be as a result of alterations to the pan wetland catchment areas, which need to be, mitigated against. The overall impact to pans for the project would be considered to be low, as mitigation measures can be adopted in order to avoid pans, as recommended in this report and thus should be acceptable for the project to continue.

Based on the findings of the current wetland assessment and the interaction of the proposed infrastructure layout with the non-perennial pans and channels, the following recommendations were made:

Avoid the destruction of the non-perennial pan wetlands

» Consider spanning the transmission lines over the wetlands and avoid placing the pylons within the wetlands and associated catchments

Mitigate the impacts on the non-perennial pan wetlands

» A timely implementation of the mitigation measures proposed in Section 11 below may result in the avoidance of indirect impacts on the receiving non-perennial pans.

Over and above the above-mentioned recommendations, it is further recommended that:

» A conservation plan for an active management of the non-perennial pan wetland areas within the project area should be developed and be included into the pre-construction Environmental Management Plan (EMP);
» It is recommended that a walk-through survey of the site and preferred power line route is undertaken prior to construction to ensure that all wetlands have been identified; and
» Due to cumulative destruction of wetland areas, loss of the associated biodiversity and the ecological functionality, it is recommended that all the role players within the region come together and devise a regional management strategy of the wetland areas.

7.3.3. Potential Impacts on Soils and Agricultural Potential

i) Results of Impact Assessment

The establishment of a power station on the farm Onbelyk will result in the permanent loss of that land to agriculture. The farm will be re-zoned and rehabilitation of the site back to agricultural production is not feasible. Therefore soil impacts other than the permanent loss of agricultural land are not relevant to agriculture.

The significance of all agricultural impacts is influenced by the fact that the land is suitable only as non-arable, moderate potential grazing land. The significance of impacts associated with the power line is further influenced by the fact that the actual footprint of disturbance of the power line is very small in relation to available, surrounding land. The loss of agricultural land and consequent loss of agricultural production is assessed in a regional context.

ii) Summary of Impact Assessment

Table 7.3 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 K**.

iii) Comparison of Alternatives

Simply by virtue of it being shorter, **option 1** has a lower impact on agricultural land, and is therefore the **preferred option**. However, as the impact of the power line is low, the difference between the options is not very significant and therefore any option would be considered acceptable.

Table 7.3: Summary of impacts on Soils and Agricultural Potential (all project components)

Potential impact	**Significance without mitigation**	**Significance with mitigation**	**Cumulative impacts**	**Residual 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 developments – medium significance.	Permanent loss (longer than 15 years) of agricultural land.
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	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	None

iv) Mitigation Measures

It is not possible to mitigate the impacts associated with loss of agricultural potential. However, impacts as a result of loss of soil resources can be minimised through the implementation of the following mitigation measures:

» 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.

v) 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 only as non-arable, moderate potential grazing land.
» The significance of impacts associated with the power line is further influenced by the fact that the actual footprint of disturbance of the power line is very small in relation to available, surrounding land.
» Soils across the power station site are very uniform, deep, well-drained, light-yellow coloured sands of the Clovelly soil form tending in places to the Fernwood form.
» Agricultural limitations are the sandy texture of the soils, which limits their water and nutrient holding capacity, and the limited climatic moisture availability.
» Agricultural land use on and surrounding the site is grazing of cattle and game.
» Agricultural sensitivity to development is uniform across the site.
» Four potential negative impacts of the development on agricultural resources and productivity were identified as:
    * Loss of agricultural land caused by direct occupation of the farm Onbelyk by the power station infrastructure (medium significance with and without mitigation).

- Loss of agricultural land caused by direct occupation of land by power line infrastructure - pylons and servitude roads (medium significance with and without mitigation).
- Soil Erosion caused by alteration of surface characteristics (low significance with and without mitigation).
- Loss of topsoil in disturbed areas, causing a decline in soil fertility (low significance with and without mitigation).

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.

7.3.4. Potential Impacts on Surface Water

i) Results of Impact Assessment

The proposed development falls within the Limpopo Water Management Area and specifically the Mokolo River catchment. The footprint of the power station falls within the A42J and A41E quaternary drainage area. Water quality in this drainage region is regarded as good. Overall, aquatic riparian flora and fauna in the area have been impacted on by cropping, grazing and burning practices. Habitat availability for macro-invertebrates is good within the Mokolo River both upstream and downstream of the industrial complex but poor at the site for the Sandloop due to lack of defined water courses (ephemeral and episodic drainage systems).

The Lephalale Municipality is dependent on the Mokolo Catchment for it's for water supply and is anticipating a substantial bloom in the local economy. The following developments will have an increased demand for water supply:

- Eskom are investigating the possibility of expanding Matimba Power Station.
- In conjunction with the possible expansion to Matimba Power Station, a feasibility study is being undertaken for a water transfer scheme to the Mokolo Dam, including modifications to the dam (raising of the dam wall).
- To supply Matimba Power Station, it will be necessary for the adjacent coal mines to expand.
- Two new coal-to-liquid fuel plants are planned by Sasol (Mafutha 1 and 2) for the possible exploitation of gas resources.
- The Thabametsi IPP Power Station (the subject of this report).
- The expansion of the above industries will support the development of secondary industries. The result will be an increased demand for water supply from the Mokolo Scheme.
- Accelerated growth in the population in the Lephalale area.

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

» Large earth moving and construction activities will take place resulting in the removal of the vegetation cover, resulting in increased risk for erosion.
» Cement and concrete batching;
» Spilling and leakages of lubricants, chemicals and fuels used during construction;
» Transportation of material to site and the storage of material on site; and
» Dust fallout as a result of construction activities

Potential impacts during this phase include:

» Destruction or degradation of drainage areas and consequent aquatic biodiversity and integrity
» Decrease in catchment yield and water supply to downstream water users due to altering/diversion of the flow of the non-perennial tributary
» Erosion of exposed topsoil by construction activities may increase suspended solids and cause siltation of watercourses
» Removal of vegetation and soil may impact on the watershed feeding the watercourses associated with the proposed Power Station
» Surface water resource and environmental contamination as a result of leakage of hydraulic fluid, fuel and oil from vehicles used in construction
» Groundwater resource and environmental contamination as a result of leakage of hydraulic fluid, fuel and oil from vehicles used in construction

Operation of the power station could also impact on the water resources in the area as a result of impacts on water quantity and quality. Potential impacts during this phase include:

» Possible increase in the regional demand for water from the Mokolo Dam Supply Scheme.
» Potential contaminated storm water run-off from the coal storage stockyard.
» Contaminated runoff from the ash dump.
» Risk of over-flow from the storm water dams into the Sandloop drainage system.
» Possible contamination of surface water resources as a result of transportation of ash to the ash dump caused by pipe burst on the site.
» Impact on the aquatic biodiversity and ecology of the river system

Activities associated with the construction and operational phases can be adequately managed through the implementation of appropriate mitigation measures.

ii) Summary of Impact Assessment

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 L.

iii) Comparison of Alternatives

There is no preference in terms of power line alternatives. Dry cooling and dry ashing technologies are preferred for implementation, as is currently proposed for the power station.

iv) Mitigation Measures

» Minimise construction footprint to be outside watercourses and riparian zones.
» Minimise disturbance to flow regime and prevent erosion.
» Install dry cooling technology to reduce water consumption at the power station.
» Implement a Water Demand and Conservation Plan for the power station construction and operation.
» Implement waste minimisation and management strategies.
» Implement appropriate stormwater management and water pollution control facilities such as Pollution Control Dams and storm water drainage system.
» Pollution control infrastructure to be designed in accordance with GN 704 and GNR 636 specifications.
» The management of storm water runoff is required to avoid spillage of contaminated water, reuse and recycling water and storm water wherever possible, treatment of water for reuse or discharge, and as a last resort, discharging storm water in compliance with Department of Water Affairs' limits.
» Implement water re-use and recycling strategies during construction and operation.
» Implement surface water monitoring programmes to monitor impacts on water quality.
» Implement a Zero Liquid Effluent Discharge (ZLED) policy
» Prevent spillages during construction and operation.
» Appropriately contain all water containing waste on site.
» Water use to be licensed for appropriate regulation and control and conditions of water use license must be adhered to.

Table 7.4: Summary of impacts on Surface Water (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Alteration of the flow regime of the catchment resulting in loss of catchment yield, degradation of in-stream riparian habitat and associated decrease in water quality	Medium (negative)	Low (negative)	A significant percentage of the natural sub-catchment of the Sandloop will be altered due to numerous developments in the area.	None.
Construction of water pipeline, roads, conveyors to the power station crossing drainage systems	Medium (negative)	Low (negative)	A significant percentage of the natural sub-catchment of the Mokolo River and its tributary the Sandloop will be altered due to numerous developments in the area.	None.
The abstraction of water for the operation of the power station could have an impact on the supply from Mokolo Dam, Reserve and associated aquatic environment as well as other users in the Lephalale geographical region.	High (negative)	Low (negative)	Increased bulk water supply to region that is already water stressed will result in frequent water shortages, reduction in catchment yield and less water available for crop production	None.
The proposed power station and associated infrastructure/ processes may have impacts on the existing aquatic fauna and flora at either of the sub-catchments within which the power station is proposed.	Medium (negative)	Low (negative)	Increased sediment load as a result of multiple developments in the region.	Bio accumulation of toxic metals within aquatic eco-systems.
Raw materials, chemicals, liquid fuels and liquid waste products used in the operation of the power station could contaminate the water resources (surface and groundwater) in the area contributing towards water quality degradation.	Medium (negative)	Low (negative)	Deterioration of water quality in the Mokolo River in the long term with loss of biodiversity as a result of numerous developments in the area.	Possible build-up of hazardous components within the footprint of the power station (ash dump, PCDs, coal stockpile).
Spillage of storm water containing waste could lead to water resource degradation.	Medium (negative)	Low (negative)	Increased waste load to the receiving environment as a result of numerous developments in the area.	Sediments with increased toxicity levels.
Diffuse pollution sources (coal dust and spilled ash) may to impact on the Sandloop	Low (negative)	Low (negative)	Sediment built up in system as a result of numerous developments in the area.	Increased risk of toxicity in streams.

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
due to sedimentation.				
Uncontrolled spillage of ash slurry polluting the environment and receiving water body. Stormwater runoff from ash dump may infiltrate aquifer and cause groundwater pollution[12].	Medium (negative)	Low (negative)	Increased sediment load to the receiving environment as a result of numerous developments in the area.	Sediments with increased toxicity levels.
Coal stock yard may impact on water quality. Storm water and groundwater contamination due to exposure of water to remnant coal leading to acidification. Potential to spill into natural environment	Medium (negative)	Low (negative)	Degradation of surface and ground water resources as a result of numerous developments in the area.	Increased metal and salinity load in the catchment.
Ash dump failure due to inappropriate long-term management causing detrimental impacts on surface and groundwater.	High (negative)	Medium (negative)	Increased risk of aquifer degradation as a result of numerous developments in the area.	Potential for aquifer to be rendered unfit for use due to contamination.

[12] Refer also to Table 7.4 and Section 7.4.

v) Conclusions and Recommendations

The primary surface water impacts associated with the development of the Waterberg IPP Power Station, ash dump and transport of coal to the Power Plant are the potential impacts on the regional water balance, water quality degradation due to wastewater discharges, storm water management at the Power Station, and possible impacts on the Sandloop where the haul road or conveyor system would cross the drainage system.

Power Station site – an investigation of the impact on regional water resources found that water demand of the Power Station would contribute significantly to the growth in demand on the WCDM water supply system. The Department of Water Affairs is currently addressing the water needs for the catchment.

Ash dump site – 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 (GN 704 Regulations), 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, and to 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.

Stormwater management – 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.

Wastewater treatment works - The disposal of effluent from the wastewater treatment works needs to adhere to the Resource Quality Objectives set for the Mokolo River sub-catchment to prevent degradation of water quality and the River Health Class.

Transportation corridor – Good dust suppression practices should be applied to prevent spillage of coal or ash material along the haul road or conveyor.

Water use license - The proposed IPP 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.

7.3.5. Potential Impacts on Groundwater

i) Results of Impact Assessment

Groundwater levels were measured in fifteen boreholes during a hydrocensus conducted in May 2013. The depth of the groundwater was found to vary between 14.4m and 53.6m below ground level. The fractured aquifer was classified as a minor aquifer (i.e. not a highly productive aquifer). Using the Groundwater Decision Tool it was found that the aquifer has a medium vulnerability and as a result it also has a medium level groundwater quality management index. This indicates that a medium level of aquifer protection is required in the area of the proposed Thabametsi Coal Fired Power Station Project.

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 main sources of this pollution are the ash dump 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 dump at the site, or if the liners are leaking. Mitigatory measures in the form of liners could prevent groundwater contamination. Other sources include fuel and oil handling facilities, laboratory waste, bulk storage areas, sewage treatment plants and solid waste disposal areas.

Based on the results of the numerical groundwater modelling potential impacts on ground water resources are as follows:

» **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/ pollution of ground water, mitigation measures should be considered (discussed in the next section). Seepage of pollutants through and around the stockpile and ash dump are the main activities that can impact on ground water resources. The borehole LEP9 could potentially to be affected by the sulphate pollution plume from the coal stockpile within 100 years after operations have commenced, if no mitigation measures are implemented. It should be noted that other privately owned boreholes, downstream of the site, could potentially be affected if pumping takes place and no mitigation is implemented, as this may accelerate

groundwater flow in the identified faults and subsequently, contaminant transport. These boreholes are LEP13 and LEP14.

» **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. Also, domestic water and waste disposal could also affect the groundwater quality.

ii) Summary of Impact Assessment

Table 7.5 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 H.

Table 7.5: Summary of impacts on Groundwater (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Contamination of groundwater due to construction of the power station.	Medium (negative)	Low (negative)	Cumulative hydro carbons contained in ground water over time can cause negative health effects on water users.	Accumulation of hydrocarbons in ground water resources.
Contamination of groundwater due to operation of the power station.	Medium (negative)	Low (negative)	Cumulative inorganic ground water contamination over time can cause negative health effects on water users.	Accumulation of inorganic pollutants in ground water resources.

iii) Comparison of Alternatives

The power lines will not impact on groundwater resources, and therefore comparative assessment is not applicable.

iv) Mitigation Measures

The following mitigation measures are recommended to minimise impacts identified:

- The ash dump and stockpile are both planned to be deposited on fault zones which elevates the risk of groundwater contamination. Therefore, these facilities should either be repositioned or lined with appropriately designed liners and/or clays to reduce infiltration and percolation of leachates to the groundwater environment.
- The water abstraction boreholes downstream of these facilities that are drilled in fault zones should reduce or preferably cease abstraction if the ash dump and stockpile are unlined. This will reduce plume acceleration. These boreholes could be re-established upstream of the facilities which may have a restricting effect on plume movement if contamination of groundwater takes place.
- Quarterly groundwater sampling must performed to establish a database of plume movement trends, to aid eventual decommissioning and rehabilitation of these facilities.
- Water samples must be taken from all the proposed monitoring boreholes by using approved sampling techniques and adhering to recognised sampling procedures. Samples should be analysed for both organic as well as inorganic pollutants, as activities at power stations often lead to hydrocarbon spills in the form of diesel and oil.
- Regular sampling and chemical analyses of the groundwater is imperative to establish a sound database:
  - Groundwater in all boreholes made available for monitoring, within a distance of less than two kilometres must be sampled regularly to establish a database against which future groundwater levels can be compared.
  - Sampling must be preferably quarterly, but at least twice annually, following the dry – and rainy seasons.
- If it is found during such a sampling event that groundwater from any extraction borehole is polluted beyond acceptable standards, alternative water will have to be supplied to the affected party, by Thabametsi Coal Fired Power Station.
- Additional mitigation measures guided by DWAF's best practice guidelines of July, 2008 should also be implemented. There are two major contamination

pathways from the ash dump and stockpile which are surface-runoff and seepage.

» Prevention/Management of the two major contamination pathways is recommended and can be done as follows:

Surface Water:

» Diversion of external surface water: A system of storm water drains may be designed and constructed to ensure that all water that falls outside the area of the stockpile and ash dump is diverted clear of the deposit. 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 0.5 m must be provided throughout the system above the predicted maximum water level.

» Construction of spillways: 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 are constructed of an impervious material able to withstand rapid flow velocities. The spillway also is 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 dump or stockpile.

» Containment of Storm Water: All water that falls within the catchment area of the stockpile and ash dump 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 to rendered acceptable for release, or re-used in some other way. It should be based on the average monthly rainfall for the area concerned less the gross mean evaporation in the area plus the maximum precipitation to be expected over a 24 hour period with a frequency of once in 50 years.

Stockpile and Ash Dump Seepage:

» Seepage is the movement of water (contaminated and uncontaminated) through and around the stockpile and ash dump on site. Primary factors affecting the volume of seepage present in a system are depth to the groundwater table and infiltration capacities of the unsaturated zone and stockpiles. Assuming that the facilities have no lining present and no mitigation measures are in place to control seepage, the possibility of a pump and treat system could be investigated if monitoring data indicates that sulphate contamination is increasing beyond acceptable levels in groundwater. The reason for this mitigation option is due to the thickness of the unsaturated zone in this area, rendering other options such as cut off trenches, unfeasible. Seepage from these facilities may also take an extended period of time to reach the phreatic surface due to its depth and the thickness of the unsaturated zone.

» Due to the possibility of groundwater contamination, quarterly groundwater sampling must be done to establish a database of plume movement trends. Water samples must be taken from all the monitoring boreholes by using approved sampling techniques and adhering to recognised sampling procedures. Samples should be analysed for both organic as well as inorganic pollutants, as activity at power stations often lead to hydrocarbon spills in the form of diesel and oil. At least the following water quality parameters should be analysed for:
  * Major ions (Ca, K, Mg, Na, SO4, NO3, Cl, F)
  * pH
  * Electrical Conductivity (EC),
  * Total Petroleum Hydrocarbons (TPH)
  * Total Alkalinity
» These results should be recorded on a data sheet. It is proposed that the data should be entered into an appropriate computer database and reported to the Department of Water Affairs and Forestry.

v) Conclusions and Recommendations

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 main sources of this pollution are the ash dump 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 dump at the site, or if the liners are leaking. Mitigatory measures in the form of liners could prevent groundwater contamination. Other 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:

» At least 4 to 6 monitoring holes should be constructed around the ash dump as well as the coal stockpile, upstream and downstream of the site. These boreholes should be sited by geophysical methods and the drilling of the holes should be overseen by a qualified hydrogeologist. These boreholes should also be subjected to 24-hour pumping tests to obtain a refined understanding of the hydraulic properties of the faults around the stockpile and ash dump.
» Boreholes should also be drilled on the Daarby Fault, upstream and downstream of the site, to determine the hydraulic properties of these structures. These boreholes should be subjected to 72 hour pumping tests to obtain data to refine and recalibrate the model.

» A monitoring network should be dynamic. This means that the network should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. An audit on the monitoring network should be conducted annually.
» The numerical model should be recalibrated as soon as more hydrogeological data such as monitoring holes are made available. This would enhance model predictions and certainty.
» Material from the stockpile and ash dump should be submitted for geochemical analysis to determine the leachability, acid generation capacity and contamination potential of each.
» Additionally, it is recommended that a regional study be undertaken to quantify cumulative impacts on at least a quaternary scale.
» With the use of mitigation measures, the impacts of the power station on ground water resources can be managed to acceptable levels.

7.3.6. Potential Impacts on Air Quality

i) Results of Impact Assessment

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).

Sources of emissions from the proposed power station were determined to be as follows:

» Power generation – stack emissions (i.e. sulphur dioxide (SO_2), oxides of nitrogen (NO_X) and particulate matter (PM))
» Coal stockpile and ash dump - dust and PM_{10}
» Unpaved roads - dust

For this study, direct impacts will result from the inhalation of NO_2, SO_2 and particulates (PM_{10}) emitted during the operational life of the Thabametsi Power Station. Direct impacts will also result from exposure to dust generated from the coal stockpiles; and from the construction of the Thabametsi Power Station and decommissioning activities. Indirect impacts resulting from emissions of SO_2 and NO_2 from coal-fired power plants include their contribution to acidification in both

dry and wet (acid rain) deposition. Further indirect effects are associated emissions of CO and CO_2. CO_2 is a GHG, adding to the global concentrations. CO is not considered a GHG, but is a strong precursor in the formation of ozone in the troposphere. The global warming potential of tropospheric ozone is equivalent to between 918-1022 tons of CO_2.

The Thabametsi Power Station is proposed to be constructed on agricultural land, and is surrounded by vast amounts of agricultural land (Figure 1.1). There is a high concentration of large scale mining activities (Grootgeluk and Grootestryd mine dump and Matimba ash dump) to the southeast of the Thabametsi Power Station. Eskom's Matimba Power is located to the south.

With respect to cumulative impacts, mining and agricultural activities, ash dumps, domestic fuel burning in the area are identified as existing sources of dust. There will thus be a cumulative impact with dust generated during construction and decommissioning of the Thabametsi Power Station, as well as during normal operations of the proposed coal stockpile and ash dump at the Thabametsi Power Station.

The Thabametsi Power Station is located in an area where there are no notable sources of dust, PM_{10}, NO_2 and SO_2 in the immediate vicinity of the site, i.e. within a 5 km radius. Motor vehicle traffic on the R510, R572, R518 and surrounding roads will have some influence on ambient air quality as will domestic fuel burning. Eskom's Matimba and Medupi Power Stations are located ~15 km to the southeast of the Thabametsi Power Station and is an important source of NO_2, SO_2 and PM_{10} at that locality. It is therefore expected that there will be compounding of effects and hence cumulative impacts during operation of the Thabametsi Power Station using coal.

Average ambient concentrations measured at the DEA's monitoring site at Lephalale are considered representative of background concentrations. Predicted ambient concentrations resulting from emissions from the Thabametsi Power Station are relatively localised and are indicated as very low at the Lephalale monitoring site for all modelled operational scenarios (See Chapter 8). The contribution to ambient concentrations beyond the immediate vicinity of the power station will be small. It is highly unlikely that they will result in exceedances of the national ambient air quality standards at the Lephalale monitoring site, and elsewhere in the area.

Sensitive receptors identified in the study area are indicated in Figure 7.4.

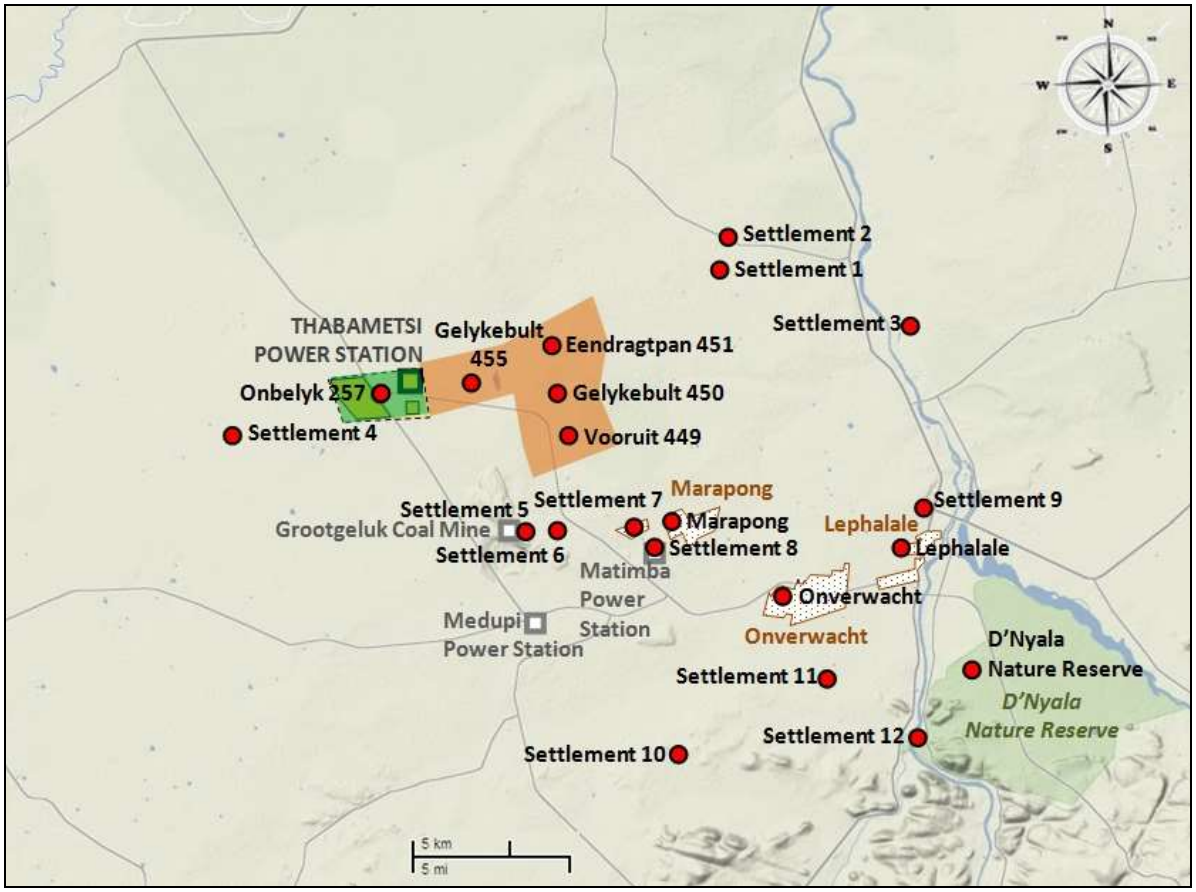


Figure 7.4: Relative location of sensitive receptor points (red dots) to the Thabametsi Power Station site. The orange and green areas indicate areas that are medium and medium high ecologically sensitive

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

Construction Phase

Construction work will entail building of new infrastructure and heavy construction work with concrete, steel, piping, etc. Dust emissions during construction result mainly from earth moving activities (scraping, compacting, excavation, grading), movement of construction vehicles and back-fill operations. Dust emissions during decommissioning result from the demolition of structures, earth moving activities (scraping, compacting, excavation, grading), movement of construction vehicles and back-fill operations. All aspects of the construction inherently generate dust, but the movement of construction vehicles on paved and unpaved surfaces at the construction site are generally the largest source of dust. Construction vehicles will be in operation for the duration of the construction and decommissioning. Dust is also easily entrained from exposed areas by the wind.

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. The impacts are also expected to be localised and limited to the area adjacent to the activity.

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 imply 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.

ii) Summary of Impact Assessment

Table 7.6 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 – coal stockpile, ash dump and stacks at 150 m
  - Normal operations – coal stockpile, ash dump and stacks at 185 m
  - Normal operations – coal stockpile, ash dump and stacks at 220 m
- Cumulative – qualitative;
- Decommissioning – qualitative.

The assessment of the potential impacts associated with the scenarios presented above is based on the comparison of predicted ambient concentrations of relevant pollutants with the South African ambient air quality standards to assess the level of compliance and the significance of the potential impact. Populated areas, or sensitive receptors, are considered in the designation of significance.

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 Thabametsi Power Station in isolation.

More detail regarding the impacts and determination of significance is provided within the specialist report contained in Appendix E.

iii) Comparison of Alternatives

The power line routing will not impact on the air emissions associated with the project. There is therefore no preference in this regard.

With respect to stack height, it is recommended that the highest possible stack is considered to promote more effective dilution and dispersion of pollutants, ensuring the lowest possible ground level concentrations.

iv) Mitigation Measures

It is important that an emission control and reduction strategy is designed and implemented, ensuring that the contribution to ambient concentrations is minimised. To this end, recommendations are made to control/mitigate dust missions during construction and decommissioning, including:

» Roads should be tarred or traffic control measures implemented to limit vehicle-entrained dust from unpaved roads e.g. by limiting vehicle speeds and by restricting traffic volumes. Unpaved road surfaces should be sprayed with a surfactant to ensure high moisture content which will bind the silt.
» The sidewalls of the ash dump should be vegetated as they rise, and the vegetation cover should be maintained to reduce the exposed area and limit wind entrainment.
» The top of the ash dump must be kept moist to bind the surface dust and prevent wind entrainment of dust.
» Stabilise open areas with dust palliative, gravel or similar

With respect to stack height, it is recommended that the highest possible stack is considered to promote more effective dilution and dispersion of pollutants, ensuring the lowest possible ground level concentrations.

Table 7.6: Summary of impacts on Air Quality and Human Health (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Cumulative air quality impacts are caused by exposure to dust generated during construction activities and decommissioning of the Thabametsi Power Station and by other existing sources in the vicinity of the power station. Dust has a nuisance impact and negatively affects quality of life by causing soiling, contamination, structural corrosion and damage to precision equipment, machinery and computers.	Low (negative)	Low (negative)	With respect to cumulative impacts, mining and agricultural activities, and domestic fuel burning in the area are identified as existing sources of dust and particulates. There will thus be a cumulative impact with dust generated during construction and decommissioning of the Thabametsi Power Station, as well as during normal operations of the proposed coal stockpile and ash dump at the Thabametsi Power Station.	None.
Air quality impacts are caused by the inhalation of NO_2, SO_2 and particulates (PM10), which are contained in emissions from the Thabametsi Power Station. The inhalation of the NO_2, SO_2 and PM_{10} at concentrations exceeding health-based air quality standards; and which are greater than the permitted number of exceedances per year, will result in negative health impacts.	Medium (negative)	Medium (negative)	The Thabametsi Power Station is located in an area where there are no notable sources of dust, PM10, NO2 and SO2 in the immediate vicinity of the site (within a 5 km radius). Motor vehicle traffic on the R510, R572, R518 and surrounding roads will have some influence on ambient air quality as will domestic fuel burning. The Matimba and Medupi Eskom Power Stations are located ~15 km to the southeast of the Thabametsi Power Station and are an important source of NO2, SO2 and PM10 at that locality. It is therefore expected that there will be compounding of effects and hence cumulative impacts during operation of the Thabametsi Power Station using coal.	None.
Indirect impacts associated with the SO_2 and NO_2 emissions relate to acidification,	Low (negative)	Low (negative)	Cumulative impacts on global warming with increased developments contributing to this	None.

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
and those associated with CO and CO_2 related to global warming			effect.	

v) Conclusions and Recommendations

The main findings of the air quality specialist study are:

Construction and decommissioning of infrastructure for the project

Impacts due to construction and decommissioning on ambient air quality concern particulate matter only and is expected to be of a temporary nuisance nature. Impacts will be limited to less than 1 km from the source and may impact on parts of the Onbelyk 257 Farm, the property on which the site is to be constructed. These impacts are expected to have a low significance.

Dustfall from the coal stockpile and ash dump

The predicted 99th percentile ambient dustfall resulting from the coal stockpile and ash dump are assessed in isolation to show their individual contribution in the ambient environment; and together to show the cumulative impact under normal operating conditions. A worst case cumulative impact considers the coal stockpile and ash dump where 100% of both areas are exposed to wind erosion. In all cases considered, dustfall rates are well below the South African dustfall standard and no exceedance of the standard is predicted within the Thabametsi Power Station site or in residential areas around the site.

PM10 from the coal stockpile and ash dump

The predicted 99th percentile 24-hour and annual average PM10 concentrations resulting from the coal stockpile and ash dump are also assessed in isolation to show their individual contribution in the ambient environment; and together to show the cumulative impact under normal operating conditions. A worst case cumulative impact considers the coal stockpile and ash dump where 100% of both areas are exposed to wind erosion. In all cases considered, predicted ambient concentrations resulting from the Thabametsi Power Station are compliant with the current and future national ambient standards. The impacts associated with PM10 from the coal stockpile and ash dump have a low significance.

PM10 from the coal stockpile, ash dump and stacks

When assessing PM10 from all sources at the Thabametsi Power Station, (i.e. the four stacks, the coal stockpile and the ash dump in combination), it is assumed that 100% of the area for both the coal stockpile and ash dump is exposed to wind erosion. This constitutes a worst case scenario. The predicted 99th percentile 24-hour and annual average PM10 are assessed for the three stack

heights, i.e. 150 m, 185 m and 220 m. In all cases considered (varying stack heights), predicted ambient concentrations resulting from the Thabametsi Power Station are compliant with the current and future national ambient standards. There is very little difference in ambient concentrations between the three stack height cases, and very little difference between the coal stockpile and ash dump (worst case scenario). It is therefore concluded that the contribution of PM10 in the ambient environment is dominated by the coal stockpile and ash dump, which are low level sources. The impacts associated with PM10 have a low significance.

NO_2 from the stacks

The predicted 99th percentile 1-hour and annual average NO2 concentrations are assessed for the three stack heights, i.e. 150 m, 185 m and 220 m. In all cases considered (varying stack heights), predicted ambient concentrations resulting from the Thabametsi Power Station are compliant with national ambient standards and no exceedance of the standard is predicted within the Thabametsi Power Station site or in residential areas around the site. A clear decrease in ambient concentrations is observed with an increase in stack height. The impacts associated with NO_2 have a low significance.

SO_2 from the stacks

For SO_2 the predicted 99th percentile 1-hour, 24-hour and annual average concentrations complies with the national ambient standard for SO_2 for the 185 m and 220 m stack height cases, and no exceedance of the standard is predicted within the Thabametsi Power Station site or in residential areas around the site. When the stack height is at 150 m, the predicted 99th percentile 1-hour and 24-hour concentrations exceed the limit value of the national standards, over a small area around the south western boundary of the Thabametsi Power Station site. However the predicted number of exceedances do not exceed the tolerance. In other words, the predicted 1-hour and 24-hour SO_2 concentrations comply with the national standards. No exceedance of the standard is predicted in residential areas around the site when stacks are 150 m high. A clear decrease in ambient concentrations is again observed with an increase in stack height. The impacts associated with SO_2 have a low significance.

Indirect impacts

Indirect impacts associated with the SO_2 and NO_2 emissions relate to acidification, and those associated with CO and CO_2 relate to global warming. The magnitude of indirect impacts associated with the operational scenarios relates to the relative contribution to acidification and global warming. While quantification of the relative contribution of the Thabametsi Power Station is difficult, the

contribution is considered to be relatively small in the national and global context. The significance of the indirect impacts is therefore anticipated to be low for all operational scenarios.

Human health risk assessment

The human health risk for development of acute and chronic adverse effects from exposure to PM10 from the stack, stockpile and ash dump and SO_2 and NO_2 from the stacks, is low at all three communities of concern (Lephalale, Onverwacht and Marapong) as well as the other off-site sensitive receptor areas investigated.

Cumulative impacts

With respect to cumulative impacts, mining and agricultural activities, tailings dams, domestic fuel burning and vehicles on dirt roads in the area are identified as existing sources of dust. There will thus be a cumulative impact with dust generated during construction and decommissioning of the Thabametsi Power Station, as well as during normal operations of the proposed coal stockpile and ash dump at the Thabametsi Power Station.

The Thabametsi Power Station is located in an area where there are no notable sources of dust, PM10, NO_2 and SO_2 in the immediate vicinity of the site (within a 5 km radius). Motor vehicle traffic on the R510, R572, R518 and surrounding roads will have some influence on ambient air quality as will domestic fuel burning. The Matimba and Medupi Eskom Power Stations are located ~15 km to the southeast of the Thabametsi Power Station and is an important source of NO_2, SO_2 and PM10 at that locality. While the predicted ambient concentrations resulting from emissions from the Thabametsi Power Station comply with ambient air quality standards, the cumulative effect of these emissions with those from Eskom's Matimba Power Station and the new Medupi Power Station are likely to result in exceedances of the ambient standards (uMoya-NILU, 2013).

It is highly likely that the AQMP for the Waterberg-Bojanala Priority Area will include emission reduction requirements to address this situation. It is important that an emission control and reduction strategy for dust is designed and implemented, ensuring that the contribution to ambient concentrations is minimised. With respect to stack height, it is recommended that the highest possible stack is considered to promote more effective dilution and dispersion of pollutants, ensuring the lowest possible ground level concentrations.

The probability of direct and cumulative impacts from dust, PM10, NO_2 and SO_2, emitted during normal operation of the Thabametsi Power Station, is considered to be high for all scenarios. The predictive modelling provides maximum

expected ambient concentrations for each pollutant based on a worst-case meteorological scenario. These results show that predicted concentrations comply with the national ambient standard throughout the study domain. Despite this, some risk to health remains and the probability of direct and cumulative air quality impacts during the operation of Thabametsi Power Station is considered to be high.

When the cumulative risk of respiratory effects is determined by adding the risks of the different pollutants to get a Hazard Index (HI), then the acute risk index is highest at Settlement 4. This HI of 1.3 indicates a moderate risk to developing respiratory effects at this site. The HI (0.4) for the communities where most people live, namely Lephalale town, which includes Onverwacht and Marapong indicates a low risk.

The risk index for chronic respiratory effects was below 1, indicating a low risk to chronic effects when exposed to all three pollutants (PM10, SO_2 and NO_2) simultaneously.

7.3.7. Potential Noise Impacts

Potentially sensitive receptors, also known as noise-sensitive developments (NSDs) were identified using Google Earth®. This was supported by a site visit to confirm the status of the identified dwellings. Potential receptors in and within approximately 2 000 meters around the proposed development were identified as NSD01 to NSD02 (refer to Figure 7.5). The following should be noted:

- NSD01 is occupied by the Manketti Ferroland Reserve Manager. The house is used as both his residence with his office and workshop located close to the house; and
- NSD02 is a dwelling used by Mr. van Wyk. The status was confirmed during a previous site visit.

Although not a NSD currently, Mr. G. Erasmus would like to use the old house (to be restored) as residential dwelling for his son. This old house is located on the farm Maaiamazamshoek. Considering the images available on GoogleEarth, this old dwelling is located more than 8 km from the proposed power station and would be at low risk of increased noise levels. This dwelling is therefore not considered at a NSD at this time.

i) Results of Impact Assessment

Measurements, a site assessment and available documents indicate that ambient sound levels in the area is very low and that the sound levels are typical of a rural

area. In terms of ambient sound levels the area can be classified as a SANS 10103:2008 Rural District in terms of the acceptable rating level for noise.

Construction Phase

Potential noise sources 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 waste disposal facilities,
» Establishment of storage (coal stockpile footprints) facilities,
» Construction of infrastructure (foundations to completed structure)

The level and character of the construction noise will be highly variable as different activities with different equipment take place at different times, for different periods of time (operating cycles), in different combinations, in different sequences and on different parts of the construction site.
Additional **traffic** to and from the site as well as traffic on the site are significant sources of noise during the construction phase. This includes trucks transporting equipment and material, contractors as well as workers. Construction traffic is expected to be generated throughout the entire construction period, however, the volume and type of traffic generated will be dependent upon the construction activities being conducted, which will vary during the construction period.

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.

With the input data as used, this assessment indicated that there exists a potential of a noise impact of medium significance during the construction phase. This specifically relates to the scenario where a number of noise generating activities takes place within 2,000 meters from receptor NSD02. It is recommended that a representative of the developer discuss the projected noise levels with this receptor before the construction phase. If the projected noise level is unacceptable to the receptor no activities are recommended in the vicinity of the receptor at night. Quarterly noise measurements are recommended at NSD01 and NSD02 during the construction phase. It must be noted that the quarterly noise monitoring would not be required if no receptors are occupying the dwelling at NSD02 (refer to Figure 7.5).

Operation Phase:

The main source of noise is associated with the intake and cooling fans, as well as material handling activities at the coal stockpile. Coal pulverising, 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, as well as traffic associated with shift changes. Noise generated from traffic during the operational phase is considered to be minimal.

The assessment also indicated that there is a low potential of a noise impact during the operational phase. No mitigation or routine noise monitoring is recommended. Should any valid noise complaints registered relating to the operation of the power station noise measurements should be conducted as recommended by an acoustical consultant.

ii) Summary of Impact Assessment

Table 7.7 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 I.

Figure 7.5: Aerial image indicating surrounding collieries and potential noise-sensitive receptors

Table 7.7: Summary of Noise Impacts (all project components)

Potential impact	**Significance without mitigation**	**Significance with mitigation**	**Cumulative impacts**	**Residual 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.	None. Impact will be removed after construction is completed.
Noise impacts associated with construction activities during the night	Medium (negative)	Medium (negative)	This impact is cumulative with existing ambient background noises as well as other noisy activities.	None. Impact will be removed after construction is completed.
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.	This impact will only disappear once the operation of the facility stops, or the sensitive receptors are no longer present.
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.	This impact will only disappear once the operation of the facility stops, or the sensitive receptors are no longer present.

iii) Comparison of Alternatives

The power lines will not result in noise impacts, and therefore comparative assessment is not applicable.

iv) Mitigation Measures

It was determined that there exists a potential for a noise impact of medium significance during the construction phase. This relates to a scenario where various activities are taking place simultaneously relatively close to NSD02 at night. The developer must discuss the projected noise level with receptor NSD02 and if the projected noise level is unacceptable to this receptor it is recommended that no night-time activities are allowed within 2,000 meters from this receptor.

The assessment also indicated that there is a low potential of a noise impact during the operational phase. No mitigation or routine noise monitoring is recommended. Should any valid noise complaints registered relating to the operation of the power station noise measurements should be conducted as recommended by an acoustical consultant. If noise measurements are conducted annual feedback should be presented to all stakeholders and other Interested and Affected parties in the area. The findings of this report should also be made available to all potentially noise-sensitive developments in the area with the contents explained to them to ensure that they understand all the potential risks that the development may have on them and their families.

v) 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. 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. The following is however noted:

- Should any valid noise complaints registered relating to the operation of the power station noise measurements should be conducted as recommended by an acoustical consultant.
- If noise measurements are conducted annual feedback should be presented to all stakeholders and other Interested and Affected parties in the area.
- The findings of this report should also be made available to all potentially noise-sensitive developments in the area with the contents explained to them to ensure that they understand all the potential risks that the development may have on them and their families.

7.3.8. Potential Visual Impacts

There are no major urban developments near the proposed power station development site, but additional viewer incidence (and expected negative viewer perception) will be concentrated within the homesteads and farm residences within the study area. The homesteads expected to be visually exposed to the proposed development are indicted below. Specific mention should be made of the Elandsvley 453 LQ commercial hunting farm, situated immediately north-east of the proposed development site. This farm is considered to be sensitive to visual intrusion, due to the nature oriented activities (e.g. hunting and game viewing) taking place at this locality.

Land owners located immediately north, north-west and west of the site objected to the proposed power station development on the grounds that it would impact on the sense of place experienced at these farms. Both the physical visual intrusion of the power station structures and activities during construction and operational phases are specific concerns raised by the land owners. These farms (Kalkvlakte 256 LQ, Maaiamazamshoek 259 LQ and Minnasvlakte 258 LQ) are indicated as specifically affected areas (sensitive visual receptors) where high impacts may be experienced.

i) Results of Impact Assessment

A schematic representation of the power station and ancillary infrastructure as viewed from the east is shown in Figure 7.6. A viewshed analyses for the proposed power station and ancillary infrastructure. The view shed analysis is shown in Figure 7.7. 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.

» 150m (stacks – these may ultimately be up to 220m high);
» 65m (the main plant / power station);
» 40m (ash dump at approximate maximum height); and
» 10 – 15m (high mast lights and other related infrastructure).

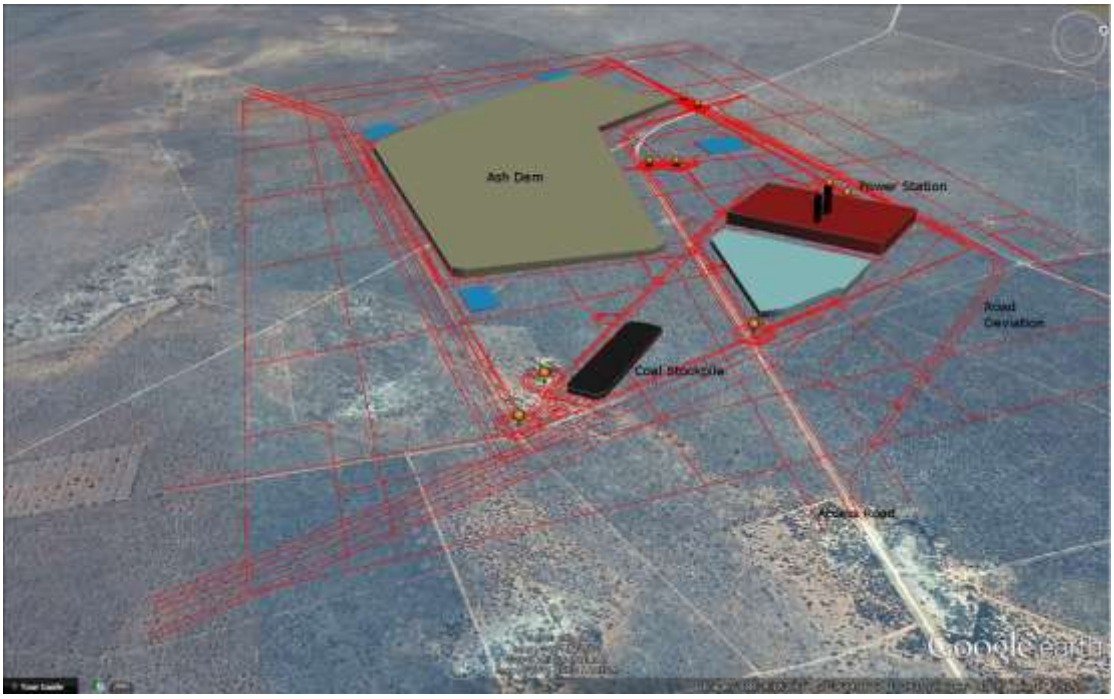


Figure 7.6: Schematic representation of the IPP Thabametsi Power Station and ancillary infrastructure as viewed from the east.

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 stacks), while other areas may be entirely exposed, thereby effectively increasing the frequency of exposed structures.

It must be noted that the effect of vegetation cover on the visual exposure of the proposed facility, is simulated by adding the natural thicket and bushland and *woodland* (as shown on the Land Cover map) to the digital terrain model (which also includes the Grootegeluk mining and ash dump elevation data). These natural vegetation types (where intact) are expected to reduce the visual exposure of the facility to a large extent. The areas of expected higher visual absorption capacity are additionally indicated on the map (refer to legend of Figure 7.7).

The proposed Thabametsi Power Station and associated infrastructure has the potential to be exposed to a large part of the study area, if the vegetation cover is not considered.

The only true and natural topographical influence on the visual exposure is evident in the limited number of depressions (located east and south-east of the site) and the weak ridge (watershed boundary north of the site) where the facility may not be visible. Other than these the greatest visual obstructions occur to the south-east, beyond the Grootegeluk Mine, the Matimba ash dump and the

Matimba Power Station. These are ironically man-made obstructions that would shield the power station from observers located within this zone.

Exposure, visual intrusion and ultimately potential visual impact are expected to be the greatest where the facility is viewed from distances of less than 3km. This zone contains a number of potentially sensitive visual receptors in the form of residences located on neighbouring farms, hunting farms as well as a large section of the Stockpoort road. Residences located within a 3km radius of the proposed power station include *Van Der Waltspan* and *Graafwater* (1). Both of these are located within Exxaro surface rights land or within the Thabametsi future mining area. A section of the farm Elandsvley 453 LQ, located north-east of the proposed power station, may also experience short distance views of the structures. This farm is indicated as a commercial hunting farm. Farms located immediately north (*Kalkvlakte 256 LQ*), north-west (*Maaiamazamshoek 259 LQ*) and west (*Minnasvlakte 258 LQ*) of the site, will be exposed to the proposed project infrastructure at short distances.

Visual exposure from a number of homesteads and roads beyond the 3km radius are also expected. Residences within this zone include: *Oliphantspad, Minnasvlakte, Elandsbos, Eendrachtpan, Graafwater (2), Goedehoop, Saagput* and *Jakkalsvlei*. However, the natural vegetation cover of the region (thicket, bushland and woodland) has a high Visual Absorption Capacity (VAC) and is expected to significantly reduce the visual exposure of most of the project infrastructure. The taller smoke stacks (modelled at 150m above ground level) is however still expected to be visible. Areas where the natural vegetation cover is still intact are indicated in Figure 7.7.

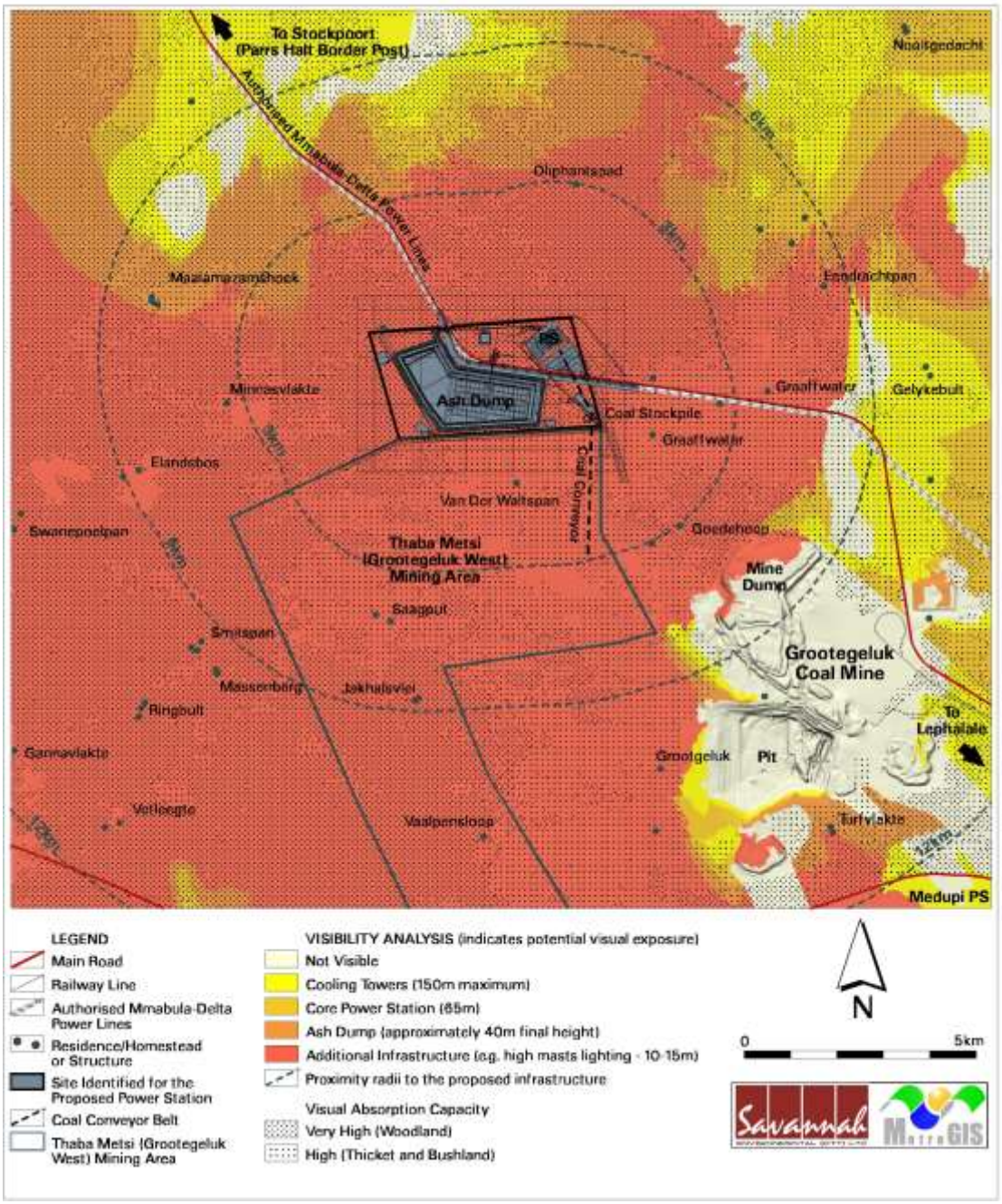


Figure 7.7: Potential visual exposure of the proposed Thabametsi Power Station structures

Based on the above, it is anticipated that the proposed Thabametsi Power Station could be easily and comfortably visible to observers (i.e. people traveling along the Stockpoort road or residing at farms and homesteads) especially within, but not limited to a 6km radius of the site. This could potentially constitute a high visual prominence, potentially resulting in a visual impact.

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed power station are displayed on Figure 7.8. The

focus for the Thabametsi Power Station will be on the areas identified as potentially having a **high** visual impact. This is generally restricted to potential sensitive visual receptors located within a 6km radius of the development (indicated as the "*likely area of potential visual impact*" on Figure 7.8).

The following is of relevance:

» The visual impact index map indicates a core zone of **moderate** visual impact within a 3km radius from the facility (south and east), where the facility could potentially be viewed from land generally devoid of sensitive visual receptors (i.e. vacant natural land). The bulk of this area is either located within the future Thabametsi mining area, or on land owned by Exxaro.
» Where sensitive visual receptors occur within the 3km radius from the facility and exposure is likely, the visual impact is anticipated to be **high** due to the relative close proximity of the observer to the power station infrastructure. Homesteads and residences located within this zone include the residences *Van Der Waltspan* (located within the future Thabametsi mining area) and *Graafwater*, also located within Exxaro surface rights land. These observers are generally believed to be associated with Exxaro and are therefore not expected to oppose the proposed power station development.
» Observers travelling along the Stockpoort road may experience a **very high** visual impact of the power station and ancillary infrastructure (e.g. ash dump, conveyors, etc.). This area is indicated as **Area 1** on Figure 7.8.
» The farm *Elandsvley 453LQ* (an identified commercial hunting farm), situated north-east of the proposed power station development, may experience a **very high** visual impact (**Area 2** on Figure 7.8). The likely area of potential visual impact is expected to be along tracks and roads traversing the south-western section of this farm, especially roads leading towards the south-western corner of the farm, bordering the power station site.
» The farms Kalkvlakte 256 LQ, Maaiamazamshoek 259 LQ and Minnasvlakte 258 LQ are indicated as Areas 3, 4 and 5 respectively on Figure 7.8. Although there may not be currently be permanent residences or lodges located on these farms, the visual impact is likely to be of **very high** magnitude. The land owners and visitors to these farms regularly traverse these potentially impacted areas, and are highly sensitised towards the proposed power station development.
» The residence identified as Area 6 on Figure 7.8 (Elandbos) is located at approximately 6km from the proposed power station site. The residents of this homestead/lodge operate a hunting safari and rare game breeding programme, and are also the owners of the farm Minnasvlakte 258 LQ. Due to the sensitised nature of the receptors present at this locality it is expected that the visual impact, even at this increased distance, may likely be of **very high** magnitude.

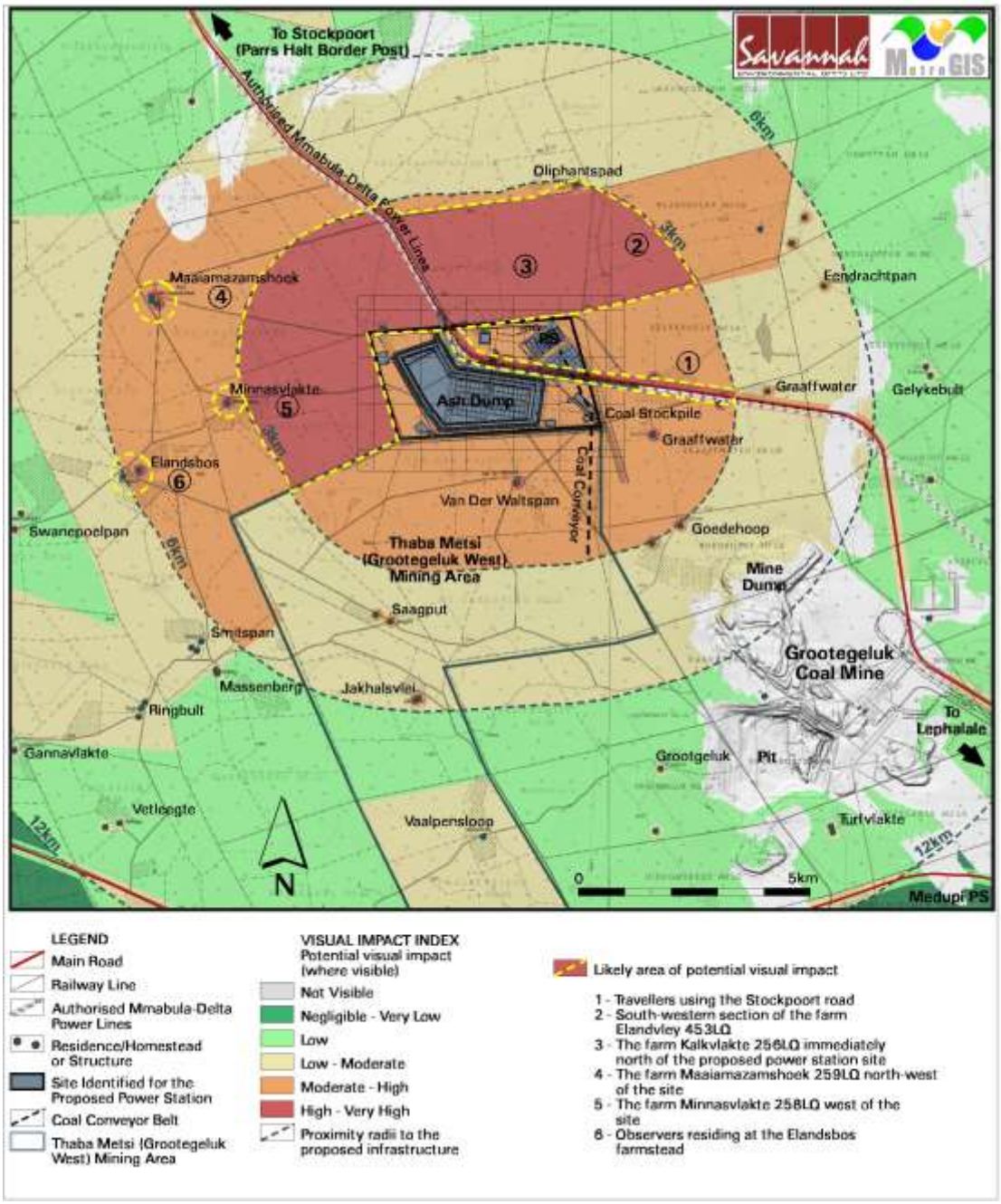


Figure 7.8: Visual impact index of the proposed IPP Thabametsi power station and ancillary infrastructure.

» The potential visual exposure within the 3km to 6km zone from the power station is expected to have a **moderate** visual impact, where sensitive visual receptors are generally absent, but may be **high** where observers are present. Homesteads and residences located within this zone mainly include *Oliphantspad, Minnasvlakte, Eendrachtpan, Graafwater (2), Goedehoop, Saagput* and *Jakkalsvlei*. It is expected though, that the vegetation cover and relative distance may negate the visual impact to large degree.

» The visual impact beyond 6km and up to 12km from the power station, is expected to be **low**, but may potentially be **moderate** where observers are present.
» Visibility beyond 12km from the proposed development is expected to have a **negligible** or **very low** visual impact.

Based on the above, it is anticipated that the proposed power station could be easily and comfortably visible to observers (i.e. people traveling along the Stockpoort road or residing at farms and homesteads) especially within, but not limited to a 3km to 6km radius of the site. This could potentially constitute a high visual prominence, potentially resulting in a visual impact.

ii) Summary of Impact Assessment

Table 7.8 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 N.

Table 7.8: Summary of Visual Impacts (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Visual impact on users of the Stockpoort road in close proximity to the proposed power station	High (negative)	Moderate (negative)	The power station is expected to increase the cumulative visual impact within the region, however the close proximity of the proposed power station to the coal supply and existing power stations (existing visual disturbances) effectively consolidates power generation infrastructure within this node.	The visual impact will be removed after decommissioning, provided the power station infrastructure is removed and the site is rehabilitated to its original (current) status. Failing this, the visual impact will remain.
Visual impact on residents of homesteads located in close proximity to the proposed power station	Moderate (negative)	Low (negative)	As above	As above
Visual impact of the power station on sensitive visual receptors within the region	Low (negative)	Low (negative)	As above	As above
Visual impact of construction on sensitive visual receptors.	High (negative)	Moderate (negative)	None	None
Visual impact on visitors to the farm Elandsvley 453LQ, Kalkvlakte 256 LQ, Maaiamazamshoek 259 LQ and Minnasvlakte 258 LQ (incl. Elandsbos residence)	High (negative)	High (negative)	The construction of the power station is expected to increase the cumulative visual impact within the region, considering the visual exposure of the power stations (Matimba and Medupi), power line infrastructure (both existing and future) and the Grootegeluk mining activities (both existing and future Thabametsi mine). Specific mention should be made of the proposed Mmabula-Delta power lines, traversing between the farms Kalkvlakte and Maaiamazamshoek which contribute to the sensitised nature of the land owners.	The visual impact will be removed after decommissioning, provided the power station infrastructure is removed and the site is rehabilitated to its original (current) status. Failing this, the visual impact will remain.
Visual impact of lighting on sensitive visual receptors	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.	As above

iii) Comparison of Alternatives

Three 400kV power line alternatives are proposed in order to evacuate electricity from the power station and to connect it to the national electricity grid. The proposed alignments and potential visual exposure of the three options are indicated on Figure 7.9.

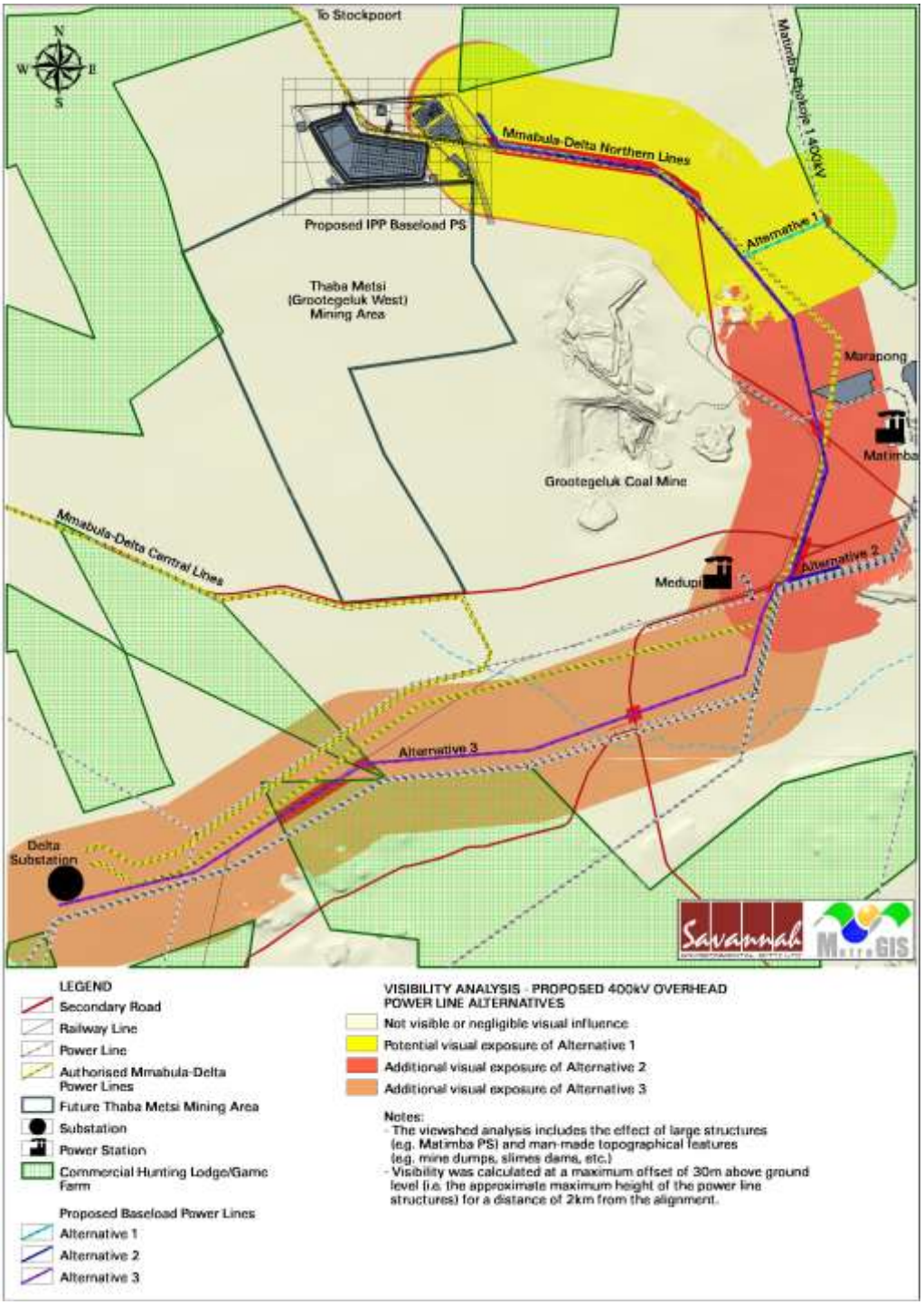


Figure 7.9: Potential visual exposure of the proposed overhead power line alternatives.

It is evident that the 400kV power lines may be visually exposed due to their relatively tall tower structures (approximately 30m high) and the flat topography it traverses. Visibility was calculated for a radius of 2km from each alignment (the expected sphere of visual influence for these types of structures) at 30m above ground level. The exposed areas indicated on the map exclude the anticipated Visual Absorption Capacity (VAC) of the natural vegetation. In spite of the high VAC these corridors of visual exposure may contain potentially sensitive visual receptors (e.g. visitors to game lodges or observers traveling along roads) that may be negatively affected.

The proposed alternatives share a common alignment for the first approximately 9km of the power lines. This section traverses adjacent to the authorized Mmabula-Delta Power Lines (northern alignment) and a section of the Stockpoort road. Exposure of the power line infrastructure from this road may have a visual impact on road users, although the power line will not be seen in isolation (i.e. the Mmamabula-Delta power lines will also be visible). The entire length of Alternative 1 traverses across Exxaro surface rights land up to the Matimba-Phokoje 1 400kV power lines.

The Alternatives 2 and 3 continue further south-wards, east of the Grootegeluk Coal Mine towards the Matimba-Spitskop 2 power lines, near the Matimba Ash Dump. These alignments traverse across the Stockpoort road, near Marapong, and the Steenbokpan road, near the Medupi Power Station. Additional visual exposure and potential visual impact may be experienced at these road crossings.

The Alternative 3 alignment continues along a host of Matimba power lines for another approximately 23km, before reaching the Delta substation. It crosses the Steenbokpan road again and traverses over a farm indicated as a commercial hunting farm. The Mmamabula to Delta power lines, both the central and northern alternatives, also traverse in a broad corridor alongside this alternative.

The proposed power line alternatives could potentially have a **high** (Alternative 2 and 3) and **moderate** (Alternative 1) visual impact on road users travelling along the secondary roads within the region, or on landowners operating commercial hunting lodges. The probability of this impact occurring gets progressively higher with each consecutive alternative, due to the expanding distance/length of the power line.

General (best practice) mitigation measures are recommended in order to reduce/mitigate the potential visual impact to **low** (Alternative 1) and **moderate** (Alternative 2 and 3).

The proposed Alternatives (1, 2 and 3) generally follow existing or authorised future power line corridors, thereby consolidating the linear infrastructure within the region. The **preferred alternative**, and also the shortest, is **Alternative 1**. The restricted length of this alternative clearly favours it above any of the other alternatives. The section along the Stockpoort road, where the likely visual impact is expected, is shared by all three alternatives. This impact would thus occur regardless of which alignment is selected.

iv) Mitigation Measures

The primary visual impact, namely the appearance of the power station and ancillary infrastructure is not possible to mitigate. The functional design of the power station cannot be changed in order to reduce visual impacts. The following mitigation is, however possible:

- The professional services of a landscape architect should be acquired in order to create a master plan for the detailed design and placement of, firstly the power station, and secondly the ancillary infrastructure. Green buffer zones should be reserved or created and maintained at critical areas surrounding the facility.
- It is recommended that the existing vegetation cover be maintained / established in all areas outside of the actual development footprint, both during construction and operation of the proposed facility. This will minimise visual impact as a result of cleared areas, power line servitudes and areas denuded of vegetation.
- In terms of ancillary infrastructure, it is recommended that access roads and other on-site infrastructure be planned so that the clearing of vegetation is minimised.
- Consolidate infrastructure as much as possible and make use of already disturbed areas rather than pristine sites, wherever possible.
- Mitigation of lighting impacts includes the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the proposed facility and ancillary infrastructure will go far to contain rather than spread the light. Mitigation measures include the following:
  - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
  - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
  - Making use of downward directional lighting fixtures;
  - Making use of minimum lumen or wattage in fixtures;
  - Making use of down-lighters, or shielded fixtures;

- Making use of Low Pressure Sodium lighting or other types of low impact lighting.
- Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

» Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:
» Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
» Reduce the construction period through careful logistical planning and productive implementation of resources.
» Plan the placement of lay-down areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
» Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
» Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
» Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
» Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
» During operation, the maintenance of the power station and ancillary structures and infrastructure will ensure that the facility does not degrade, thus aggravating visual impact.
» Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.
» Once the facility has exhausted its life span, the main facility and all associated infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.
» All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

» Where sensitive visual receptors are likely to affected, it is recommended that the developer enter into negotiations regarding the potential screening of visual impacts, either at the receptor site or along the perimeter of the facility. This may entail the planting of vegetation or the construction of landscaped berms or screens.

v) Conclusions and Recommendations

The vegetation cover of this region is possibly the single most important element in the construction and operation of the IPP Thabametsi Power Station, and should be revered as a critical component in the mitigation and potential negation of the visual impact. A landscape architect should create a master plan for the detailed design and placement of, firstly the power station, and secondly the ancillary infrastructure. Green buffer zones should be reserved or created and maintained at critical areas surrounding the facility.

The removal of natural vegetation should be limited to the bare minimum and should not be undertaken without proper planning and delineation. Individual vegetation communities should be identified and earmarked as visual absorption buffer zones. The activities and movement of construction vehicles and personnel during the construction phase should be restricted to help prevent the wanton destruction of natural vegetation that could play an important role in the long term mitigation of visual impacts.

The clearing of vegetation for servitudes should be restricted to the bare minimum required for the servicing and maintenance of infrastructure. Other potential mitigation measures for the proposed power station include the maintenance and general appearance of the facility. These measures focus on the fact that if/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. Natural hues that complement the natural environment (i.e. light sky blue where the facility is seen against the skyline or pale green where it is seen against vegetation cover) can soften the general appearance of the power plant.

A number of mitigation measures have been proposed, which, if implemented and maintained, will reduce the significance of certain visual impacts associated with the proposed facility.

If mitigation is undertaken as recommended, it is concluded that the significance of anticipated visual impacts will **generally** remain at acceptable levels. A **specific concern**, however, relates to the potential visual impact of the proposed power station on visitors to the farm *Elandsvley 453*, *Kalkvlakte 256 LQ, Maaiamazamshoek 259 LQ* and *Minnasvlakte 258 LQ*. The construction and operation of the power station will place an additional visual burden on this farm and will generally further impact on the sense of place of the region in general and the farm in particular.

It should however be borne in mind that the power station is not the first industrial/mining related development in the area and do not constitute a primary visual impact in a pristine wilderness area. It will contribute to an increase in industrial activities in the Lephalale area and will, together with the existing power stations and the mining activities (both existing and future) set the trend for possible continued development and expansion (and ultimately visual encroachment) on the farm. It is debatable whether the construction of the facility would ultimately lead to an irreconcilable conflict between the tourism and hunting activities within the region, and industrial and mining developments. It is generally expected that the bushveld character will come under more visual pressure from these developments in the future.

It is highly advisable to engage with the land owner in order to amiably and proactively address these potential (and valid) concerns. Site specific mitigation measures and possible compensation may be required in this case.

Besides the above concern, the facility and the proposed ancillary infrastructure would be considered to be acceptable from a visual perspective, provided that the mitigation measures are strictly enforced.

7.3.9. Potential Impacts on Heritage Sites

i) Results of Impact Assessment

The heritage survey found the following heritage features on the site:

- Two ruins possibly dating to the 1950's.
  - Ruin 1 covers an area of 5x6 meters. Ruin 1 consists of the demolished remains of a dwelling with 4 rooms. The building was constructed with clay bricks and is possibly a farm labourer dwelling. Associated with the site is a water dam and water tank.
  - Ruin 2 covers an area of 10x12 meters. Ruin 2 is a much larger setup and was possibly the old farm house. The site is also totally demolished and the only remains are rubble of clay and modern bricks. Both sites will be directly impacted on by the proposed power station footprint.

» One visible grave of Hendrik Johannes van Wyk who passed away in 1959.
» A single kopje known as Nelsonskop has engravings on the southern face of the kopje with ephemeral stone walls on top of a hill. Engravings of animal spoor, ceramics, stone walls and MSA artefacts occur on this site. The transmission alternatives 2 & 3 traverses approximately 60 meters to the east of the site.

The ruins they are of low heritage significance and based on the date from the associated grave are not older than 60 years and therefore not protected by legislation. Ruin 1 will be directly impacted on by the proposed development footprint while Ruin 2 is located on the periphery of the development and a secondary impact is foreseen on the site. No further action is necessary for these sites but it must be kept in mind that sites like these may contain graves that has not been recorded. The recorded grave site of Mr van Wyk is also located on the periphery of the power station footprint and a secondary impact is foreseen on the site. The site is already fenced with an access gate and it is recommended that a buffer zone of 20 meters is kept around the site and demarcated by a fence. If the site is fenced off with a 20 m buffer zone the grave will be protected in situ, which will be the preferred option.

ii) Summary of Impact Assessment

Table 7.9 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 G.

Table 7.9: Summary of impacts on Heritage Sites (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Impacts of the power station on the two ruins (heritage sites of low significance).	Low (negative)	Low (negative)	None.	None
Impact of the power station a grave site.	High (negative)	Medium (negative)	If the mitigation recommendation is followed and the site is preserved no cumulative impact is foreseen on graves in the area.	None
Visual impact on cultural landscape.	High (negative)	Low (negative)	None as no direct impact is foreseen on the site.	Archaeological and cultural sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.

iii) Comparison of Alternatives

Power Line Alternative 1 is the preferred option from a heritage point of view as this power line alignment does not impact on any recorded heritage resource. Alternatives 2 and 3 are aligned just to the east of Nelsonskop (also known as Koorn Kop) where engravings of animal spoor, ceramics, stone walls and middle Stone Age artefacts occur.

iv) Mitigation Measures

» Prior to construction, s heritage walk through must be conducted for the power line route. Any heritage sites recorded during this survey could be mitigated by micro adjustments of the tower positions.
» If any heritage finds such as tool scatters, bone or fossil remains are exposed or noticed during construction, activities must be stopped and a qualified archaeologist must be contacted to assess the heritage find.
» Due to the subsurface nature of archaeological material and graves the possibility of the occurrence of unmarked or informal graves and subsurface finds cannot be excluded. If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find.

v) 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.

7.3.10. Potential Traffic Impacts

i) 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/from the power station.
  * 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.

» ***Operational Phase***
  * Transportation of coal: from the Grootegeluk Coal Mine, Thabametsi Coal mine to the IPP Power Station using internal haul roads, conveyer belts and truck transport.
  * 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.
  * 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.

» ***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.

Table 7.10 below summarises the typical peak hour expected transport requirements of the power station.

Table 7.10: Peak Hour Transport Requirements for all Phases of the Proposed Power Station

Analysis scenario	Construction Phase	Peak Operational Phase	Decommissioning Phases
Private Vehicles	75	94*	80
Trucks	7(during peak hours)	2*	8
Buses	3	4*	2
Taxis	20	23*	9
Total number of vehicles	**105**	**123**	**99**

*Private vehicles: 157(90%)/1,8 = **79** + **15** (Supervision) =**94***

***Refers to figures acquired from IPP Waterberg Power Station. Accurate information was not available at the time of preparation of this report*

The finding of traffic impact assessment are summarised as follows:

» The D2001 Road is currently a gravel road between Grootegeluk Coal mine and is the main access road to the IPP Thabametsi Power Station site. Upgrading of this section of the D2001 Road will be required in terms of surfacing of the road between the D2001 / Grootegeluk Access intersection and the access to IPP Thabametsi Power Station (approximately 11km in distance).
» Access would be controlled by stop signs on the side roads allowing free flow on the main road. It is expected that the access intersection would operate at

an acceptable Level of Service (LOS) once the proposed development is operational.

» The operational phase is anticipated to be the critical period in terms of additional trip generation and road traffic. The trips generation prediction for that period is in order of ± 123 vehicle trips during the AM and PM Peak Hours. Based on the traffic study, the additional trips to be generated will not pose a significant impact on the external road network.
» Existing access can accommodate the existing traffic and the future traffic demand (including trucks to/from the power station).
» The interaction (turning movements) between public transport and privates vehicles might pose a safety hazard, therefore mitigation measures and good traffic management will be required.

ii) Summary of Impact Assessment

Table 7.11 provides a summary of the assessment of potential traffic impacts. More detail regarding the impacts and determination of significance is provided within the specialist report contained in Appendix M.

iii) Comparison of Alternatives

In terms of impacts on traffic, the impact of the construction of the power line will not be as significant as the development of the power station. Therefore comparative assessment of the power line alignments in terms of traffic impacts is not applicable.

Table 7.11: Summary of Traffic Impacts (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Traffic impacts associated with the IPP Thabametsi Power Station	High (negative)	Medium (negative)	Would add to other power stations in the area	The power plant will be a prominent feature in the area
Impacts on Access Road D2001 Road (±11km)	High (negative)	Low (negative)	It is imperative to surface this section of the road to accommodate the additional traffic volumes and to prevent dust and noise pollution	Surfaced road would improve accessibility to the surrounding area
Impact on intersections: D2001 / D1675 Road and D2001 / Access to IPP Power Station Intersections	High (negative)	Low (negative)	The upgrades are required to provide additional capacity at these intersections to accommodate the additional development traffic.	Intersection upgrades would improve traffic congestion on the surrounding road network

iv) Mitigation Measures

The following measures can be adopted to mitigate the traffic impacts associated with development of the power station:

- A portion of the D2001 Road, approximately 11km from the D2001 / Grootegeluk Access intersection to the proposed access point of the power station site may need surfacing to accommodate the traffic.
- It is recommended that the D2001 / D1675 intersection be upgraded to a traffic signal controlled intersection and the D2001 / Matimba power station access road be upgraded by an additional through lane on the D2001 Road.
- Provision of separate turning lanes at the access intersection on the D2001 Road.
- Provision of lighting at sufficient standards at the intersections of the D2001 Road / Access (IPP Waterberg Power Station).
- Provision of road signage and road markings.
- In terms of public transport provision as well as pedestrian safety:
  - No on-street pick up / drop offs at the intersection of the D2001 Road with the access road to the development should be allowed (drop-offs / pickup should be done on site.
- Construction of an access point on the D2001 Road with exclusive left and right auxiliary lanes, on all approaches of the main roads as indicated in Drawing 3054/EB/01. The exclusive left and right auxiliary lanes should be constructed with a 60m long and a 60m taper.
- Permits for transportation of abnormal loads on public roads must be obtained, if required.

All of the above mitigation measures should be in place before the commencement of the operational phase of the power station.

v) Conclusions and Recommendations

The traffic volumes generated by the proposed IPP Thabametsi Power Station development will not have a significant impact on the external road network. In terms of the intersection and road link capacity, no further improvements are recommended since the intersections under investigation are expected to operate at acceptable level of service with the proposed upgrades in place. Good traffic management during the construction phase and operational phase will ensure that traffic impacts are limited and manageable. The findings of the traffic impact assessment for proposed IPP Thabametsi Power Station conclude that the proposed development should be favourably considered from a traffic engineering point of view by the relevant authorities.

7.3.11. Potential Socio-Economic Impacts

i) Results of Impact Assessment

The specialist socio-economic study highlighted that the IPP Thabametsi 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 spread 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. Table 7.12 below shows various receptors that will be affected by the development and socio-economic impacts that can be expected to be experienced by them during various stages of the project's lifespan.

Table 7.12: Summary of potential socio-economic implications on land uses

Receptors	Cause	Potential socio-economic implications	Extent	Phase
Site	Establishment of power station on site.	» Sterilisation of land	Site	Construction, operation and decommissioning
Surrounding commercial game farms	Environmental issues (noise, air quality visual impacts etc.)	» Potential loss of annual revenue due to the decrease in tourist numbers » Potential loss of employment » Decline in property value	Surrounding area/zone of influence	Construction and operation
People living, working and visiting the surrounding farms	Environmental issues (noise, air quality visual impacts etc.), increase in traffic and influx of people	» Loss of sense of place » Possible increase in crime and social conflicts » Disruption of lives and deterioration of living conditions	Surrounding area	Construction, operation and decommissioning
Surrounding livestock and private farms	Environmental issues (noise, air quality visual impacts etc.)	» Decline in property value	Local economies	Construction, operation and decommissioning
Economy	Procurement spend, household income increase and value added created	» Expansion of primary and secondary industries » Increase in employment » Increase government revenue	Local and national economies	Construction, operation and decommissioning
Communities	Job creation and increase in household income	» Increase in standard of living due to ad	Local and national economies	Construction, operation and decommissioning
Social and	In-migration of	» Increased pressure on	Local	Construction &

Receptors	Cause	Potential socio-economic implications	Extent	Phase
economic infrastructure	people and movement of goods	social infrastructure due to potential increase in population » Increased pressure on economic infrastructure, specifically roads, electricity and bulk water supply	economies	Operations

Table 7.13 summaries the total gains and losses associated with the construction, operation, and decommissioning of the proposed Thabametsi Power Station.

Table 7.13: Summary of socio-economic gains and losses during project phases

Impact	Total gains	Total losses	Net effect
Construction (7 years)			
Production (2013 prices)	R30 245 million	~ 50 million (land sterilisation and game farming revenue loss) in the worst case scenario	Positive
Employment	32 830 FTE	463 (game farming employment loss)	Positive
Household income	R4 723 million	<R25 million	Positive
Government revenue	R978.3 million	None	Positive
Skills development	Enhancement and development of new in construction	-	Positive
Local real estate industry	Positive due to demand for housing	Negative due to possible decline in agricultural property values, particularly game farms (two private farms)	Unknown
Living conditions	-	Deterioration, 100-170 people affected	Negative
Influx of people	-	Change in demographics and increase in social pathologies	Negative
Economic and social infrastructure	-	Increased pressure on social and economic infrastructure	Negative
Operations (40 years)			
Production	R12 745 million (per annum)	~R7 million (per nnum) in the worst case scenario	Positive
Employment	7 766 FTE[13] per annum	66 in the worst case scenario	Positive
Household income	Gains by employees of the IPP and supporting businesses	Loss by farmers and farm employees	Positive
Government revenue	R1 007.3 million per annum	Loss of personal income tax	Positive

[13] Full Time Employment

Impact	Total gains	Total losses	Net effect
Skills development	Enhancement and development of new skills in operation of the plant	-	Positive
Local real estate industry	-	Negative due to possible decline in agricultural property values, particularly game farms (four private farms)	Negative
Standard of living	Improved due to additional income earned by HHs	Deteriorated due to altered sense of place	Unknown
Decommissioning			
Production	R1 890 million	None	Positive
Employment	1 314 FTE jobs	None	Positive
Standard of living	Improved among HHs benefiting from created employment	Deteriorated among those living in adjacent farms	Positive

Based on the information presented above, the potential benefits outweigh the potential losses that could ensue because of the establishment of the IPP Thabametsi Power Station. Stimulation of production, employment, government revenue, skills development, and household income as result of the investment in the project and its subsequent operations will outweigh possible production, employment and household income losses that could be experienced by local economic activities affected by changes ensuring from various environmental impacts. Some of the negative impacts during the construction phase will not be offset by respective gains; however, they could be mitigated and the majority would cease to exist once construction is complete. Adherence to proposed mitigation measures would ensure that the offset of the impacts is more balanced and takes into account communities and businesses that will be negatively affected.

ii) Summary of Impact Assessment

Socio-Economic Impacts during construction

The proposed establishment of the Thabametsi Coal-Fired Power Station and associated infrastructure will be associated with both positive and negative impacts during all stages of the project's lifespan. The following paragraphs summarise the socio-economic impacts that are expected to ensue due to the project.

The proposed development of the Thabametsi Coal-Fired Power Station will sterilise agricultural land and is expected to aggravate some of the developmental challenges observed in the local economy, specifically as far as provision of services and infrastructure are concerned. It is also expected to jeopardise the

viability of some of farms that are part of local game farming industry due to the expected environmental impacts that could ensue. Deterioration of living and working conditions, increase in social pathologies, and possible decline in selected properties' values are other negative effects that could take place. Most of these impacts though will be of a temporary nature and could be mitigated to some extent; importantly, they will predominantly be application to the surrounding area or the local economy and cease to exist once the construction of the power station is complete.

Contrary to the negative impacts, the positive effects that are expected to ensue during construction will be of a greater extent that the local economy and will be of high to moderate significance. Over the entire construction period, the project will generate R30 245 million of business sales in 2013 prices that will translate into R11 516 million of value added. Considering the annual impacts expected, this equates to between 0.02% and 0.07% of the national economy. Furthermore, 32 820 FTE jobs will be created throughout construction, of which one out of five will be created in the Lephalale area and will positively impact on the unemployment levels. Government revenue, improved living standards of households and skills development are among the other positive impacts that can be expected.

The following table describes the impacts that are envisaged to take place during construction.

Table 7.14 provides a summary of the assessment of potential socio-economic impacts during the construction phase. More detail regarding the impacts and determination of significance is provided within the specialist report contained in Appendix J.

Table 7.14: Summary of Socio-Economic Impacts during the construction phase (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Temporary increase in production and GDP-R of the national and local economies during construction	High (Positive)	High (Positive)	Numerous developments are expected within Lephalale LM, which include among others mines and additional power stations. It is highly likely that if the projects were approved by government the demand for goods and services required for construction of similar facilities would grow. On one hand, this could provide sufficient economies of scale and thus open opportunities for the establishment of new industries in the country and new businesses in the local area, specifically in the sectors that are not well developed in the local economy. On the other hand, it might put pressure on certain local industries, which products are required in the construction and that are usually sourced from nearby areas due to high transportation costs, for example river sand. Appropriate planning with respect to the activities and preliminary investigation into the local supply capabilities should mitigate this impact.	None.
Creation of employment in local and national economies though direct and multiplier effects as a result of capital expenditure and construction activities	High (Positive)	High (Positive)	Opportunity to upgrade and improve skills levels in the area considering the envisaged development of a local Coal, Energy and Petrochemical Cluster	Skilled individuals in community able to utilise skills on other development projects.
Skills development due to the creation of new employment opportunities	Medium (Positive)	High (Positive)	Improved labour productivity and employability of construction workers for similar projects	Training and skills development will improve the construction workforce skills and qualifications
Increase in government revenue due to investment	Medium (Positive)	Medium (Positive)	Lower government debt and servicing costs	None.
Improved standard of living of households directly or indirectly benefiting from	Medium (Positive)	Medium (Positive)	» Improved productivity of workers » Improved health and living conditions of	Possible increase of households' savings accounts

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
created employment opportunities			the affected households » Reduction in local poverty » Reduced dependency on social grants	
Stimulation of the local business tourists and real estate industry due to the influx of workers and contractors	Medium (Positive)	Medium (Positive)	Depending on whether other developments planned for the are realised on not, the proposed facility will either fill the gap created in the market post-construction of the Medupi Power Station or will increase the need for more low-medium cost buy-to-rent options.	» While the demand for affordable housing is high and could possibly increase, it could make access to housing by households who do not have sustainable income or cannot afford it more challenging. This could lead to a further sprawl of informal settlements in the area. » After the completion of the construction phase, the demand for rental housing could sharply decline, which could significantly alter the local real estate market.
Loss of agricultural potential in the area due to sterilisation of land	Medium (Negative)	Medium (Negative)	With the proposed developments in the area and the envisaged formation of the Energy, Coal and Petrochemical Cluster in Lephalale, it is highly likely that more land parcels will be sterilised of the agricultural potential. This is particularly considering the fact that many mining and industrial corporations have already purchased farms in the area, which could be attributed to them preparing for further development of the area.	Although after decommissioning the farm could potentially be returned to agricultural land use, it will unlikely be restored to the same capability levels.
Impact on the local game farming and tourism industry	Medium (Negative)	Medium (Negative)	Due to the exiting mine and power station, as well as the soon-to be developed new power station and mine, the project will contribute to the loss of attractiveness of the local area as game hunting destination	Decline in industries relying on game farms for business
Deterioration of standard of living among households dependent on the local game	Medium (Negative)	Medium (Negative)	Increase in prevalence of poverty and unemployment	The displacement of people no longer drawing an income from economic activities

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
farming industry				in the area may lead to an increase in homelessness, poverty and informal settlement
Change in the demographics of the area due to potential influx of workers and job seekers	Medium (Negative)	Medium (Negative)	Increase in male population which may lead to social conflicts	» Increased competition for public services and resources » Increased potential for crime and the spread of sexually transmitted diseases (STDs)
Increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.)	Medium (Negative)	Medium (Negative)	The other developments planned for the area will most likely increase the number of job seekers migrating into the area, which could worsen the situation	» Unplanned pregnancies » Worsened living conditions
Deterioration of living and working conditions due to various environmental impacts	Medium (Negative)	Medium (Negative)	» Dissatisfaction of local residents with the change in living conditions » Loss of productive time due to increase in traffic » Dissuasion of tourists to the area due to the loss of sense of place » Increased commuter times » Greater need for emergency services to respond to accidents » Greater traffic volumes on local roads due to increased local development	Possible improvement of local road infrastructure, if mitigation measures are implemented
Impact on property and land values in the surrounding area	Medium (Negative)	Low (Negative)	The combined effects of all the industrial activity in the area may cause multiplier effects on the local property and business values. Such an impact, though, could either be positive and result in increase in property values as the industrial activities amplify and the demand for land grows or could lead to the decline in property values as the spatial extent of industrial activities expands and the zone of influences shifts further afield.	Change in the image of the area as being industrialised versus being more known for its game farming activities

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Added pressure on basic services and social and economic infrastructure	Medium (Negative)	Medium (Negative)	Contribution of existing and future industrial developments on the capacity of local infrastructure	The effects that a shortfall or gain in infrastructure and service capacity will have on the local economy and communities

Socio-Economic Impacts during operations

The proposed Thabametsi Power Station will operate for about 40 years, which means that all impacts exerted during that period will be of a long-term. Most of the impacts expected to ensue during that stage are of positive nature. These include stimulation of production and GDP-R in the country to the value of R12 745 million and R6 202 million per annum in 2013 prices respectively. A considerable portion of the above will be retained in the Lephalale economy, which will stimulate its growth and contribute to its sustainability. In addition, the proposed power station will create and sustain on an annual basis 7 766 FTE jobs, of which 239 will be created at the plant itself. Government would also benefit from sustainable income stream, while households benefiting from job creation will experience improvement in their livelihoods. Furthermore, the project will also invest in the local communities through various socio-economic development initiatives and skills training.

The noise, visual impacts, and potential deterioration of air quality will though lead to a number of negative impacts on the surrounding environment particularly considering its profile. It is expected that during operations, more privately owned farms could experience decline in property values than that observed during construction. Some of business activity reliant on tourists could also experience decline in revenues, which could further affect the lives of households depending on income generated from these farms

Table 7.15 provides a summary of the assessment of potential socio-economic impacts during the operational phase. More detail regarding the impacts and determination of significance is provided within the specialist report contained in Appendix J.

Table 7.15: Summary of Socio-Economic Impacts during the operational phase (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Sustainable increase in production and GDP-R of the national and local economies through operation and maintenance activities	High (Positive)	High (Positive)	» Improved electricity supply and energy security in the country » Together with the existing and currently constructing power stations in the area, the proposed project creates opportunities for achievement of sufficient economies of scale to establish new businesses in the local economies that would supply goods and service required for the operation and maintenance of the facility that are currently unavailable in the area; this would contribute to the local economies' growth and development	None.
Creation of long term employment in local and national economies through operation and maintenance activities	Medium (Positive)	Medium (Positive)	Improved living standards of the directly and indirectly affected households	Experience in operating a power station
Increase in government revenue stream	Medium (Positive)	Medium (Positive)	Possible improvement in local service delivery	Long-lasting benefits derived from government's spending
Skills development and knowledge transfer	Medium (Positive)	Medium (Positive)	Better trained and skilled labour force for future industrial development in the area	Greater employability of the workers benefiting from training programmes
Investment in the local community and economic development projects as part of Corporate Social Investment Programme	Medium (Positive)	Medium (Positive)	» Decreased levels of poverty in the Lephalale LM » Improved standards of living of the members of the Community Trust and households that benefited from CSI projects » Possible improvements in access to services and status of local infrastructure	None.
Improved standards of living of households benefiting from sustainable job creation	Medium (Positive)	Medium (Positive)	» Improved productivity of workers » Improved health and living conditions of	None.

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
			the affected households	
Altered sense of place	Medium (Negative)	Medium (Negative)	» Entrenched image of an industrialised area and decreasing perception of the area as being a tourism destination » Greater impact on people visiting, working, and living on farms located in the zone of influence that overlaps with zones of influence created by Grootegeluk Coal Mine and Matimba Power Station	» Altered characteristics of the environment » Change perceptions of visitors to the area
Impact in local game farming industry and its potential revenue losses	Medium (Negative)	Medium (Negative)	» The decline in the local game farming industry » The closure of game farms and relocation of farm workers	Perception of the area as a game farming destination will change
Altered lives of households depending on the local game farming industries	Medium (Negative)	Medium (Negative)	» Worsening of the unemployment situation in the area » Possible increase in local poverty levels » Strong resentment towards future developments in the area	» Possible income losses of farm owners » Displacement of people forced to move
Impact on property and land values in the surrounding area	Medium (Negative)	Medium (Negative)	The combined effects of all the industrial activity in the area may cause multiplier effects on the local property and business values. Such an impact, though, could either be positive and result in increase in property values as the industrial activities amplify and the demand for land grows or could lead to the decline in property values as the spatial extent of industrial activities expands and the zone of influences shifts further afield.	Change in the image of the area as being industrialised versus being more known for its game farming activities

Socio-Economic Impacts during decommissioning

Socio-economic impacts stimulated during the decommissioning phase are expected to be similar to those that take place during the construction phase; however, it will take place over a shorter period of two years. It will also be associated with some expenditure, although it will be considerably smaller than investment required during the development phase. Besides the positive impacts on production, employment, household income, and government revenue that could ensue from the project, some negative impacts could also occur. These would largely be related to a potential increase in noise in the area surrounding the site, increase in traffic congestion due to vehicle movements, and concerns over local safety and security due to a greater number of people accessing the area. All of these causes would ultimately lead to the deterioration of the quality of life of people residing in the area.

Table 7.16 provides a summary of the assessment of potential socio-economic impacts during the operational phase. More detail regarding the impacts and determination of significance is provided within the specialist report contained in Appendix J.

Table 7.16: Summary of Socio-Economic Impacts during the decommissioning phase (all project components)

Potential impact	Significance without mitigation	Significance with mitigation	Cumulative impacts	Residual impacts
Temporary increase in production and GDP-R of the national and local economies	Medium (Positive)	Medium (Positive)	None.	None.
Temporary increase standards of living and employment	Medium (Positive)	Medium (Positive)	None.	None.
Temporary deterioration of living and working conditions	Medium (Negative)	Low (Negative)	None.	None.

iii) Comparison of Alternatives

The proposed IPP Thabametsi Power Station will require connection to the national electricity grid. Three power line alignments have been proposed. Regardless of the alignment chosen, each of the power lines would be associated with some positive impacts on business sales and employment. The construction and operation of the transmission lines are also associated with some environmental disturbances that would change the sense of place in the area that will in turn lead to a negative impact on the local game farming industry and the value of the local properties and businesses. Additionally, the potential damage to properties and loss of assets during both construction and operation are a concern.

All of the positive impacts can be enhanced to increase the benefits to the local communities; while negative impacts could be mitigated. Mitigations and enhancement measures suggested for the construction phase would apply. Overall though, impacts that would ensue during the decommissioning will mostly be of low significance and should not affect the decision regarding the proposed development. Although Alternative 3 is associated with higher positive impacts for production and employment; it is recommended that Alternative 2 is considered as a preferred choice, closely followed by Alternative 1.

Table 7.17 outlines the comparative assessment of the three power line alignments. Due to the length of Alternative 3 and the comparison of its zone of influence, it is the least preferred choice, but the preferred choice from the impact on production and employment. Considering the duration of the positive impacts and the long-lasting effects of the negative impacts expected to ensue, it can be suggested that the former will not be able to offset the latter and Alternative 3 is the last preferred choice from the socio-economic perspective, which means that the preferred route should be chosen between Alternative 1 and Alternative 2. There is a **slight preference of Alternative 2** over Alternative 1 due to the latter possibly experiencing a bigger impact on one of the game farms that will also be affected by Alternative 2. However, as mentioned the difference in terms of potential impacts between these route is marginal and both could potentially be pursued.

Table 7.17: Preferred alternative considering each impact

Impact	Preferred choice
Production and employment stimulus	Alternative 3
Sense of place	Alternative 1 (next best choice Alternative 2)
Impact on local businesses	Alternative 2 (next best choice Alternative 1)
Land and business values	Alternative 2 (next best choice Alternative 1)
Property of land owner and households	Alternative 2 (next best choice Alternative 1)

iv) Mitigation Measures

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 to determine their concerns and take into consideration any mitigating proposal.
» 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.
» Close to the construction period, investigate whether the gap in the rental market will be created linked to the completion of the construction of the Medupi Power Station and when other industrial and mining developments in the area are expected to be launched migration measures.
» Prior to construction, perform a skills audit to determine the potential skills that could be sourced in the area.
» 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.

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.
» Night-time lighting should be limited to a minimal but should not jeopardise the safety and security at the facility.
» Natural areas that are not affected by the footprint should be retain as such and avoided to be disturbed during operations.
» Profit generated by the projects supported through the social responsibility programme should be considered for re-investment in the community to create new businesses and generate more wealth for the community member
» Compensate landowners for losses. Agreements should be reached through negotiations so that developers can try to offset potential losses in property values.

v) Conclusions and Recommendations

The construction and operation of the IPP Thabametsi 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-based power plant include an increase in national electricity capacity, economic development, job creation, increase in household income, and government revenue. However, the coal-based power station will be associated with a number of other negative effects that are more challenging to quantify and to offset. These are associated with the sense of place, property values, social pathogens, standards of living, and pressure on socio-economic infrastructure. 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. 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.

7.4. The 'do nothing' alternative

The 'do-nothing' alternative is the option of not establishing a new coal-fired power station at a site in Lephalale, Limpopo Province.

The electricity demand in South Africa is placing increasing pressure on existing power generation capacity.

The National Integrated Resource Plan (IRP) developed by the Department of Energy has identified the need for power generation from coal as part of the technology mix for power generation in the country in the next 20 years. The need for the project at a national scale has therefore been determined. The 'do nothing' option will, therefore, not address this national need and may result in the electricity demands in the country not being met in the short-term.

This has serious short- to medium-term implications for socio-economic development in South Africa.

Without the new proposed coal-fired power station in Lephalale, an alternative means of generating an additional 1200 MW capacity would be required to be sought from another power generation source or a similar source in another area. However, as more than 50% of the remaining coal reserves in the country are located in the Waterberg area, and optimal grid connection opportunities are available, not developing the project on the proposed site would see such an opportunity being lost. At a local level, the level of unemployment will remain the same and there will not be any transfer of skills to people in terms of the construction and operation of the power station.

This power station is intended to be an IPP project to alleviate pressure on Eskom's baseload power supply in the short- medium term through independent power generation. Without the implementation of this project, this will not be achieved, and the greater power supply in the country will be compromised in the near future. This has potentially significant negative impacts on economic growth and social well-being. In addition, limitations on electricity supply may impact the environment in general due to local air quality impacts due to use of low quality coal for domestic purposes, collection of wood from natural areas, etc. Therefore, the no-go option is not considered as a preferred option.

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 coal-mining related projects within the area.

8.1. Approach Taken to Assess Cumulative Impacts

A cumulative impact, in relation to an activity, refers to 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 undertaking in the area. In the sections below the potential cumulative impacts of other industrial-type developments within the region are explored. 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

Over 50% of South Africa's remaining coal reserves lie in the Waterberg coalfields, a 3 500km^2 expanse of Limpopo that stretches into Botswana and hosts almost 76 billion tonnes of in-situ inferred resources in 11 coal-bearing zones. The government has plans to proclaim the area as the Limpopo Coal, Energy and Petrochemical Cluster, as a means of utilising the potential of the Waterberg Coalfield to produce energy for the national economy. In order to exploit this resource, therefore, a number of new coal mines are proposed in the Waterberg area, and the expansion of existing coal mines is proposed. In addition, a number of coal-fired power generation facilities are located or proposed to be located within this region.

Existing and planned industrial-type developments in the region include:

» Matimba Power Station operated by Eskom Holdings SoC Limited
» Medupi Power Station currently under construction on behalf of Eskom

» Grootegeluk Mine operated by Exxaro Coal
» Two new coal-to-liquid fuel plants are planned by Sasol (Mafutha 1 and 2) for the possible exploitation of gas resources (proposed development)
» The 1200MW IPP Thabametsi Power Station and associated infrastructure (proposed) – the subject of this report
» Thabametsi Coal Mine and associated infrastructure (proposed)
» Sekoko Coal Mine and associated infrastructure (proposed)
» Boikarabelo Power Station and associated infrastructure (proposed)
» Vendanta Power plant and associated infrastructure (proposed)
» Dalyshope Phase 1 Colliery and associated infrastructure (proposed)
» Char Plant (proposed)
» Ledjadja Coal (Pty) Ltd
» Mmamabula Energy Complex in Botswana (CIC Energy Corp); and
» Rezoning of properties in the project area for the development of a residential area and an industrial park

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-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 levels of habitat loss and fragmentation. Impacts of a cumulative nature on biodiversity, 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.

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 have 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 game farm and hunting operations within the broader study area, of which three falls within the site boundary. Livestock and agriculture (limited) are practiced to a lesser extent. Cumulative impacts relate to the permanent loss of agricultural land for game and cattle farming as well as for crop production. Due to the large area affected by the proposed developments (more significantly the mining developments), impacts are potentially significant. Due to the limited crop production in the wider study area, the development of multiple developments within the region is not expected to affect food security in the region.

8.3.3. Potential Cumulative Impacts on Surface Water Resources

Potential impacts on surface water relate to impacts on water quantity and quality in the region. The large number of developments proposed within the Lephalale area, together with the expanding population (largely in response to job opportunities being created in the area) is placing pressure on the water resources in the area. The Department of Water Affairs (DWA) is currently implementing the first phase of the Mokolo and Crocodile (West) Water Augmentation Project (MCWAP), consisting of a new pump station with a total pumping capacity of 1.3m³/s fed from the Mokolo Dam outlet works, and a new 42.7 km pipeline generally running parallel to the existing pipeline, from the pump station to the Point of Supply close to Matimba Power Station. The completion of MCWAP 1 will allow for the full abstraction of the unused yield from the dam still available for allocation. The second phase of the MCWAP project will

supply additional water to the area thereby reducing the deficit for development. This phase includes the establishment of a transfer scheme from the Crocodile River (West) at Vlieëpoort near Thabazimbi to the Lephalale area.

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. However, this impact can be successfully minimised through the implementation of appropriate management activities. Cumulative impacts in this regard are therefore expected to be of **low 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 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 dump and coal stockpile at the power station, as well as the wastewater treatment works. Should these activities result in impacts on groundwater resources (as detailed in the specialist investigation undertaken in this regard – refer to Appendix H), cumulative impacts with the nearby mining activities (including the Thabametsi mine) may occur. Although these potential impacts could not be quantified (due to no data being available from other developments in the area), these impacts are potentially significant as the groundwater in the area is utilised by landowners for stock watering and potable supply. Appropriate management is therefore vital in this regard. In the instance of the proposed power station, the implementation and management of an appropriate liner system at both the ash dump and coal stockpile areas 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

With respect to cumulative impacts on air quality and human health, mining and agricultural activities, and domestic fuel burning in the area are identified as existing sources of dust and particulates. There will thus be a cumulative impact with dust generated during construction and decommissioning of the proposed

Thabametsi Power Station, as well as during normal operations of the proposed coal stockpile and ash dump at the power station.

The Thabametsi Power Station is located in an area where there are no notable sources of dust, PM_{10}, NO_2 and SO_2 in the immediate vicinity of the site (within a 5 km radius). Motor vehicle traffic on the R510, R572, R518 and surrounding roads will have some influence on ambient air quality as will domestic fuel burning. The Matimba and Medupi Power Stations are located ~15 km to the south-east of the proposed power station site and are an important source of NO_2, SO_2 and PM_{10} at that locality. It is therefore expected that there will be compounding of effects and hence cumulative impacts during operation of the Thabametsi Power Station using coal. It is highly likely that the AQMP for the Waterberg-Bojanala Priority Area will include emission reduction requirements to address this situation. 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. With respect to stack height, it is recommended that the highest possible stack is considered (i.e. 220m) to promote more effective dilution and dispersion of pollutants, ensuring the lowest possible ground level concentrations.

The probability of direct and cumulative impacts from dust, PM_{10}, NO_2 and SO_2, emitted during normal operation of the power station, is considered to be high for all scenarios. The predictive modelling provides 99^{th} percentile ambient concentrations for each pollutant based on a worst-case meteorological scenario. These results show that predicted concentrations comply with the national ambient standard throughout the study domain. Despite this, some risk to health remains and the probability of direct and cumulative air quality impacts during the operation of power station is considered to be high.

When the cumulative risk of respiratory effects is determined by adding the risks of the different pollutants to get a Hazard Index (HI), then the acute risk index is highest at Settlement 4 south of the farm of Onbelyk. This HI of 1.3 indicates a moderate risk to developing respiratory effects at this site. However, the HI (0.4) for the communities where most people live, namely Lephalale town, which includes Onverwacht and Marapong indicates a low risk.

The risk index for chronic respiratory effects was below 1, indicating a low risk to chronic effects when exposed to all three pollutants (PM_{10}, SO_2 and NO_2) simultaneously at the concentrations modelled in this study.

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.

The archaeology of the wider region is characterised by Middle Stone Age sites generally associated with pans and ancient drainage systems throughout the larger study area. Other sites in the area relate to some Iron Age cattle posts around pans and some ceramics. The potential for the identification of Middle Stone Age artefacts in the region is therefore high, specifically in the vicinity of pans. No sites of significance are known to occur on the proposed power station site. However, the site at Nelsonskop (as described in the Heritage Impact Assessment contained in Appendix G) is considered to be of Medium to High heritage significance. The number of developments in the area increases the risk of impact on this site.

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.

8.3.7. Potential Cumulative Visual impacts

The construction of the power station is expected to increase the cumulative visual impact within the region, considering the visual exposure of the power stations (Matimba and Medupi), power line infrastructure (both existing and future) and the Grootegeluk mining activities (both existing and future Thaba Metsi mine). The potential exist for combined visibility (where two or more facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more facilities along a single journey (e.g. road or walking trail)). However, given the high visual absorption capacity of the vegetation in the area, the potential cumulative impact on the area's overall sense of place is likely to be limited to long-distance views. However, the issue of skyglow from lighting and the impacts of this on the rural nature of the area could present a potentially significant impact, specifically to game and hunting farms in the area which are utilised by tourists.

It could however also be considered that close proximity of the proposed power station to the coal supply and existing power stations (existing visual disturbances) effectively consolidates power generation infrastructure within this node.

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, specifically in the 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.

However, the numerous developments in the area may put pressure on certain local industries, from which products are required in the construction and that are usually sourced from nearby areas due to high transportation costs, for example river sand. Appropriate planning with respect to the activities and preliminary investigation into the local supply capabilities should mitigate this impact. 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 agriculture and game farming. This could impact on the tourism industry which is focussed around the game farms in the area, with subsequent impacts on employment in this sector.

8.4 Conclusions Regarding Cumulative Impacts

Water and coal are key natural resources which drive the development of mines and power station developments. The Waterberg area is an identified node for coal and energy having been included as part of the Coal, Energy and Petrochemical Cluster identified by government. At this stage, more than 50% of South Africa's remaining coal reserves are located within the Waterberg Coalfield. Due to the development of the MCWAP by DWA, water is not currently a limiting factor in the area, although this is likely to become limiting in the future.

The development of the IPP Thabametsi Power Station along with at least two other coal-fired power stations in the Waterberg coal-field 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

Newshelf 1282 (Proprietary) Limited (the "Project Company"), an Independent Power Producer (IPP) is proposing the construction of a coal-fired power station (the "Project") on a site near Lephalale in the Limpopo Province. The proposed coal-fired power station will have a generating capacity of up to 1 200 MW which is intended to provide electricity for integration into the national grid. The purpose of the proposed IPP Thabametsi Power Station[14] is to provide baseload power to the national electricity grid.

The main infrastructure that is required for the IPP Thabametsi coal-fired power station includes *(specifications will be determined based on the technology selected):*

» Access roads.
» Coal storage areas and bunkers. Coal is to be provided to the power station from the new Thabametsi mine proposed to be established to the south-east of the site.
» Pipeline for water supply. Water is to be supplied from the allocation to Exxaro Coal from the Mokolo-Crocodile Water Augmentation Project (MCWAP). It is also necessary to consider water supply from the Crocodile River for further expansion.
» Coal loading and offloading areas, as well as conveyor belts.
» Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room).
» Ash dumps.
» Wastewater treatment facilities (including Raw-Water Storage Dams, wastewater treatment works, purification works and reservoirs).
» A High Voltage Yard.
» Overhead power lines to connect into the Eskom grid. The power generated is planned to evacuate into the electricity grid at a point to be determined in consultation with Eskom. Three alternative power line routes have been proposed for consideration in the EIA process (refer to Chapter 3 for more details in this regard).
» Office and maintenance area/s.

The environmental impact assessment (EIA) for the proposed IPP Thabametsi Power Station has been undertaken in accordance with the EIA Regulations of June 2010, 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:

[14] Previously referred to as the IPP Waterberg Power Station.

» 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.
» Nominate a preferred power line alternative corridor for consideration by the decision-making authorities (i.e. DEA and LDEDET).
» 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 IPP Thabametsi 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 the transmission lines
» Impacts associated with waste treatment and management activities

9.1.1. Impacts associated with the power station and associated infrastructure

All components of the proposed IPP Thabametsi Power Station, apart from the power lines, will be located within the Farm Onbelyk 257 LQ. This site was

selected as being technically feasible on the basis of availability of the fuel resource (i.e. coal from the Thabametsi Mine), availability of grid connection, water availability, site access, and land availability. Through the scoping study, the site was identified as being the least sensitive of the alternatives considered from an environmental perspective.

Potential impacts associated with the proposed power station and associated infrastructure 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 (refer to Figure 9.1).

Impact sources associated with the power station and transmission lines 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, 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. 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.

  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. While a significant impact is expected on the protected trees that occur on the site, the conservation status and regional abundance of these species are not expected to be affected on a local or regional scale. The overall impact to pans/wetland areas for the project would be considered to be low, as mitigation measures can be adopted in order to avoid pans/wetland areas. Similarly, animals could potentially be affected severely, but the mobility of most species that are of conservation concern, renders the probability of this impact unlikely.

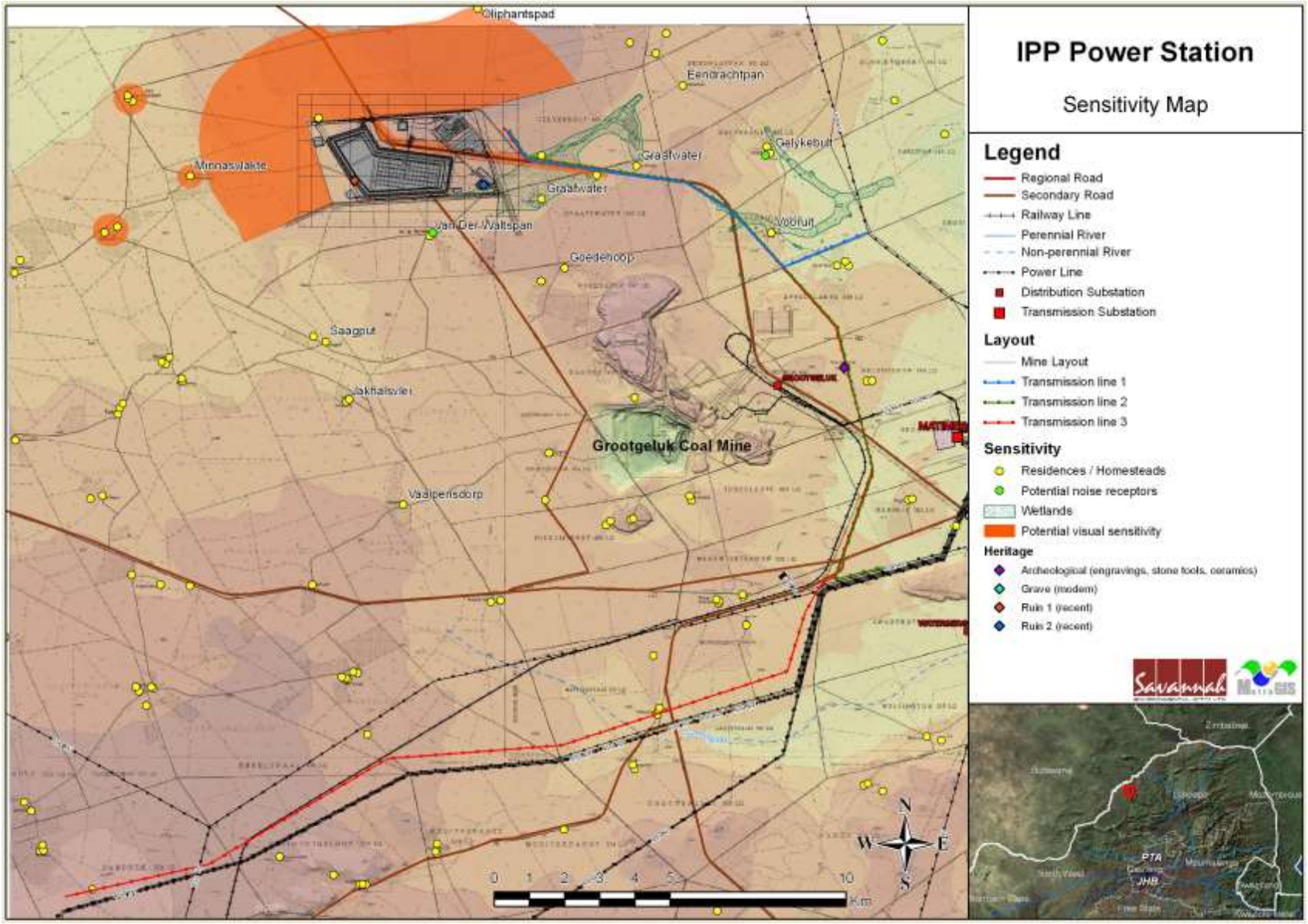


Figure 9.1: Sensitivity Map

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 is suitable only as non-arable, moderate potential grazing land. Soils on the site are sandy in texture and have limited water holding capacity. 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 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 through the MCWAP scheme being developed by the Department of Water Affairs. As proposed for the project, the implementation of dry cooling and dry ashing is the preferred technology in order to minimise water required therby reducing impacts on water resources. Impacts on water quality relate to sedimentation and contamination during both 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 dump and coal stockpile areas. 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. A borehole monitoring network should be established for the site in order to monitor groundwater quality.

» ***Impacts on air quality and human health*** associated with the construction phase (dust) and the operational phase (emissions from the power station). Impacts associated with the construction phase will be restricted to the Farm Onbelyk and are expected to be of low significance. Impacts during operation relate to dust from the ash dump and coal stockpile as well as emissions (SO_2, NO_2 and PM10) from the power station. From the results of the modelling undertaken, air emissions are predicted to be below the national air emission standards. Impacts are expected to be of **low significance** for all emissions. Impacts on human health are predicted to be of **low significance** at all three communities of concern (Lephalale, Onverwacht and Marapong) as well as the other off-site sensitive receptor areas investigated. It is however recommended that the highest possible stack height (i.e. 220m considered in this assessment) be implemented in order to further reduce the risk of impacts.

» ***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 both the construction and operational phases are however expected to be of low significance. No mitigation or routine noise monitoring is therefore required in the operation phase of the facility.

» ***Visual impacts*** associated with power station and associated infrastructure. Potential visual impacts are expected to be of **Medium significance**, with instances of potential **High significance** at localities in close proximity to the facility (such as the farms *Elandsvley 453 LQ, Kalkvlakte 256 LQ, Maaiamazamshoek 259 LQ* and *Minnasvlakte 258 LQ*). An issue of potential concern relates to lighting associated with the power station and the impact of this on the rural nature of the area. Mitigation measures are recommended for consideration during the detailed design phase in order to minimise visual impacts associated with the proposed project. The vegetation cover of this region is possibly the single most important element in the construction and operation of the IPP Thabametsi Power Station, and should be revered as a critical component in the mitigation and potential negation of the visual impact.

» ***Impacts on Heritage Sites*** during the construction phase. Two ruins and a grave site were identified on the power station development site. These sites were estimated to be younger than 60 years (based on the date on the grave

headstone) and are therefore not considered to be of heritage significance. Potential impacts on a heritage site of significance (Nelsonskiop) is associated with the proposed power line alternative 3, which passes in close proximity of this site. Specific management in this area would be required to minimise the risk of any impacts on this area should this alternative be selected as the preferred option. 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.

» ***Traffic impacts*** associated with construction and operation of the power station. The traffic volumes generated by the proposed IPP Thabametsi Power Station development will not have a significant impact on the external road network. In terms of the intersection and road link capacity, no further improvements are recommended since the intersections under investigation are expected to operate at acceptable level of service with the proposed upgrades in place. Good traffic management during the construction phase and operational phase will ensure that traffic impacts are limited and manageable. The findings of the traffic impact assessment for proposed IPP Thabametsi Power Station conclude that the proposed development should be favourably considered from a traffic engineering point of view by the relevant authorities. .

» ***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-based power plant include an increase in national electricity capacity, economic development, job creation, increase in household income, and government revenue. However, the coal-based power station will be associated with a number of other negative effects that are more challenging to quantify and to offset. These are associated with the sense of place, property values, social pathogens, standards of living, and pressure on socio-economic infrastructure. 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. 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*** associated with the development of numerous industrial type developments in the region. Water and coal are key natural resources which drive the development of mines and power station developments. The Waterberg area is an identified node for coal and energy having been included as part of the Coal, Energy and Petrochemical Cluster identified by government. At this stage, more than 50% of South Africa's remaining coal reserves are located within the Waterberg Coalfield. Due to the development of the MCWAP by DWA, water is not currently a limiting factor in the area, although this is likely to become limiting in the future.

The development of the IPP Thabametsi Power Station along with at least two other coal-fired power stations in the Waterberg coal-field 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.

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 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 dump 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. A borehole monitoring network should be established for the site in order to monitor groundwater

quality. In addition, an appropriate Integrated Water and Waste Management Plan (IWWMP) must be developed and implemented for all phases of the proposed project.

9.2. Selection of Preferred Power Line Alternative

In general, the nature and extent of impacts identified to be associated with the power line alternatives is dependent on the alignment which is selected. From the specialist studies undertaken, various conclusions have been drawn regarding the preferred alternative for establishment of the power line. Table 9.1 provides a summary of the preferences in this regard.

Table 9.1: Preferred power line alternatives as nominated by the specialist studies

Issue	Alternative 1	Alternative 2	Alternative 3
Biodiversity	**Preferred**	Not preferred but acceptable	Least preferred
Wetlands	**Preferred**	Not preferred but acceptable	Least preferred
Soils and agriculture	**Preferred**	Not preferred but acceptable	Least preferred
Visual	**Preferred**	Not preferred but acceptable	Least preferred
Heritage	**Preferred**	Not preferred but acceptable	Least preferred
Socio-economic	2nd preferred	**Preferred**	Least preferred

There is no preference in terms of alternatives in terms of surface and groundwater, noise, air quality and traffic.

In terms of the conclusions of the specialist studies, all alternatives are considered to be acceptable. Alternative 3 is the least preferred from all aspects as it is the longest in length. This route follows a portion of the authorised Mmamabula-Delta power line corridor and is therefore not expected to present any fatal flaws. Alternative 1 is considered to be the most preferred in terms of all aspects apart from socio-economic considerations. In terms of socio-economic impacts, Alternative 2 is only slightly preferred over Alternative 1. On the basis of these conclusions, **Alternative 1** is nominated as the preferred alternative from an environmental perspective. However, as all alternatives are considered to be acceptable from an environmental perspective, the final determination of the preferred power line alternative should be made on the basis of technical considerations in consultation with Eskom.

9.3. 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 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. The project is considered to be acceptable from an environmental perspective.
» No 'no-go' areas were identified within the project development area or along the power line routing alternatives, although some areas of sensitivity were identified (refer to Figure 9.1).
» No environmental fatal flaws were identified to be associated with the proposed project.
» From the assessment of the alternative power line alternatives, **Alternative 1** is considered to be the alternative which would result in the lower impact on the environment. However, as all alternatives are considered to be acceptable from an environmental perspective, the final determination of the preferred power line alternative should be made on the basis of technical considerations in consultation with Eskom.
» The significance levels of the majority of identified negative impacts can be minimised by implementing the recommended mitigation measures.

9.4. 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 IPP Thabametsi Power Station and associated infrastructure be authorised by DEA.

The following conditions of this recommendation must be included within the authorisation issued:

» 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.

- 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.
- An independent Environmental Control Officer (ECO) must be appointed by the project developer prior to the commencement of any authorised activities.
- Conduct an ecological walk through survey for the power station and all associated infrastructure including power lines. Results of this survey will guide permitting requirements for the removal of protected trees from the selected property.
- Conduct a heritage and paleontological walk through survey for the power station and all associated infrastructure including power lines. Any heritage sites recorded during this survey could be mitigated by micro adjustments of the layout or through the recording of the site prior to destruction.
- During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
- Monitoring of waste treatment and management facilities throughout all phases of the project.
- Develop and implement an Integrated Water and Waste Management Plan (IWWMP) for all phases of the project.
- Develop and implement a traffic management plan for the construction and operational phases of the power station
- 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 to be designed in accordance with GNR 704 and GNR 636 specifications.
- Design and implement an air quality management plan for the operational phase of the power station. This should include an emission control and reduction strategy to ensure that the contribution to ambient concentrations is minimised.
- A detailed Alien and Invasive Plant Management Plan must be developed and implemented throughout the project cycle up to the decommissioning phase.
- Develop a rehabilitation programme that makes use of locally endemic species.
- Site rehabilitation of temporary laydown and construction areas 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.
- Applications for all other relevant and required permits required to be obtained by the developer must be submitted to the relevant regulating authorities.

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