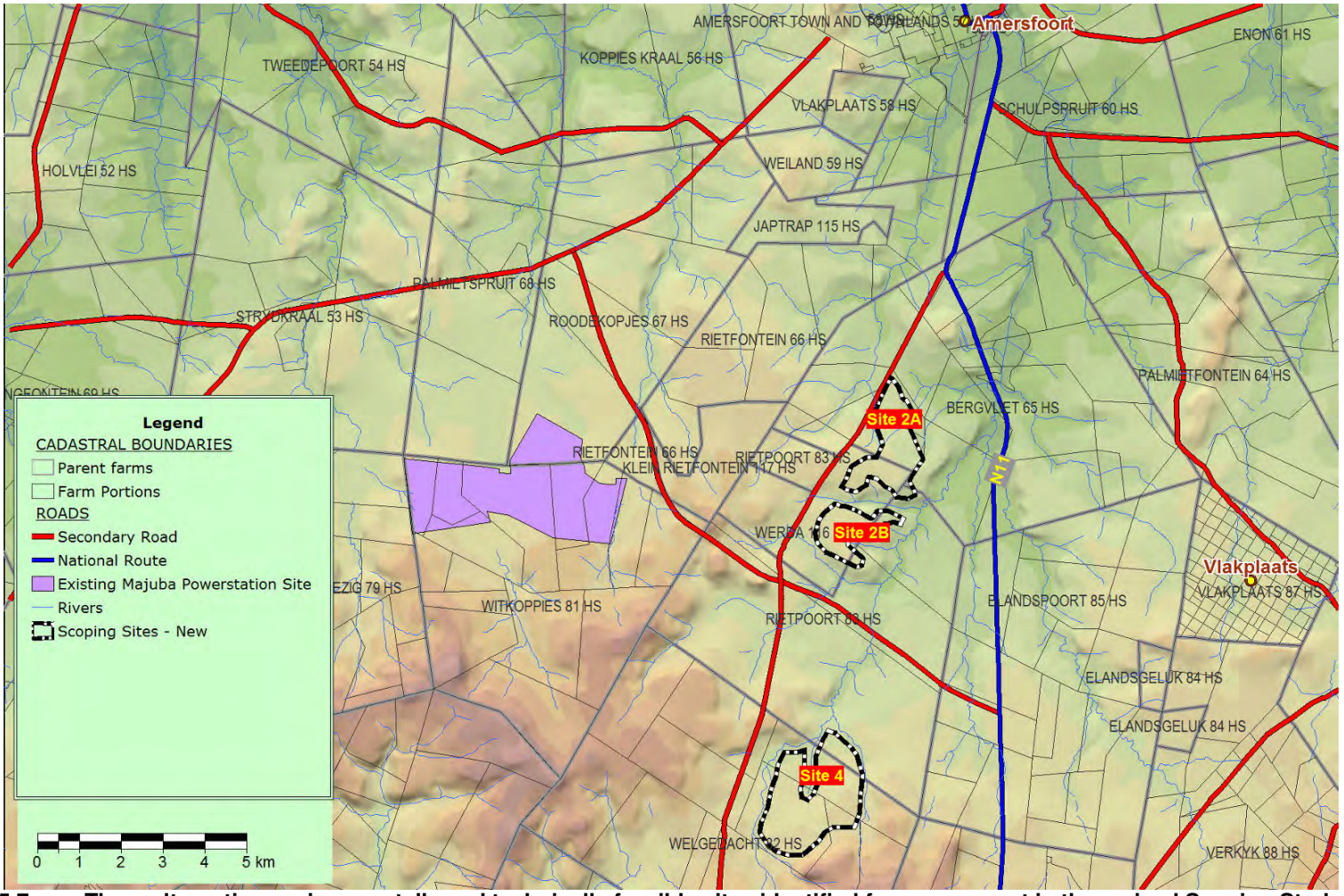

Figure 5.7 Three alternative environmentally and technically feasible sites identified for assessment in the revised Scoping Study

6. ALTERNATIVES

In terms of the Environmental Impact Assessment (EIA) Regulations, feasible alternatives should be considered within the Environmental Scoping Study. All identified, feasible alternatives should be evaluated in terms of social, biophysical, economic and technical factors.

6.1 Strategic Alternatives

Strategic alternatives refer to those alternatives that were considered at a higher level than this project-level EIA, e.g. the alternative geographical regions for the location of a new power station in South Africa that were considered and assessed prior to the inception of this EIA process including combustion technologies, type of fuel sources to be used, etc. Similarly, alternative methods of generating electricity were identified and have been addressed as part of the Integrated Energy Planning (IEP), the National Integrated Resource Plan (NIRP) from the National Energy Regulator of South Africa (NERSA), and the Integrated Strategic Electricity Plan (ISEP) undertaken by Eskom (refer to Chapter 1 of this Report). This strategic evaluation, together with technical evaluation, concluded that the gas turbine technology is the only technology that is able to utilise the UCG fuel and generate electricity with high efficiency. Alternative methods of generating electricity will not be considered further as part of this study. This Scoping Study therefore considers a number of other alternatives including siting, plant layout, access, water supply and technology alternatives as well as the do-nothing alternative (discussed below) considered in terms of the proposed Combined Cycle Gas Turbine (CCGT) power plant in the Amersfoort area, and does not evaluate any other power generation or storage options being considered by Eskom.

6.2 The 'Do Nothing' Alternative

The ‘do-nothing’ alternative is the option of not establishing a CCGT power plant in the Amersfoort area, Mpumalanga Province.

Electricity cannot be stored in large quantities and must be used as it is generated. Therefore, electricity must be generated in accordance with supply-demand requirements. The demand for electricity in South Africa is currently growing. This growing electricity demand is placing increasing pressure on Eskom’s existing power generation capacity. South Africa is expected to require additional peaking capacity (i.e. times of peak demand for electricity) and baseload capacity in the medium- to long-term, depending on the average growth rate. This has put pressure on the existing installed capacity to be able to meet the energy demands into the future, particularly during peak electricity demand times.

The “do-nothing” option will result in Eskom not being able to fulfil its mandate and meet the projected growth in demand for electricity. This has serious short- to medium-term implications for socio-economic development in South Africa. This potential negative economic impact is considered to be significant.

Therefore, the “do-nothing” option is not seen as a feasible alternative for the project, and hence is rejected as a feasible alternative. The “do-nothing” option will not be considered further in this process.

6.3 Site Alternatives

Based upon the screening/site selection study described in Chapter 5 - Site Selection Summary (refer to Appendix H), a total of ten candidate sites were identified for the possible location of the CCGT power plant and associated infrastructure. With further workshops conducted during the Screening exercise, seven sites were eliminated for various reasons as indicated in Chapter 5 and Appendix H (Screening/ Site selection report). Three alternative sites were then selected as being potentially the most viable candidate sites for the location of the CCGT plant. These three sites (Sites 2A, 2B and 4) were investigated in more detail during this issues-based Environmental Scoping Study, and all three sites will further be studied in the EIA phase.

6.4 Layout Alternatives

To date, no potential layouts have been proposed for the alternative sites. Alternative power station layouts will be informed by the results of the various specialist studies engaged in the EIA process.

6.5 Technology Alternatives

6.5.1 Cooling Technologies

With respect to the main cooling systems, the proposed CCGT plant may either be wet-cooled or dry-cooled. Dry-cooled systems are less water intensive than wet-cooled systems. Due to imperative for water conservation in the region, wet cooling will not be considered further in this EIA.

There are two types of equally proven dry cooling systems, namely direct dry cooling and indirect dry cooling - .

In the direct dry system, the turbine exhaust steam is piped directly to the air-cooled, finned tube, condenser. The finned tubes are usually arranged in the form of an 'A' frame or delta over a forced draught fan to reduce the land area. The steam trunk main has a large diameter and is as short as possible to reduce pressure losses, so that the cooling banks are usually as close as possible to the turbine (see Figure 6.1 below).

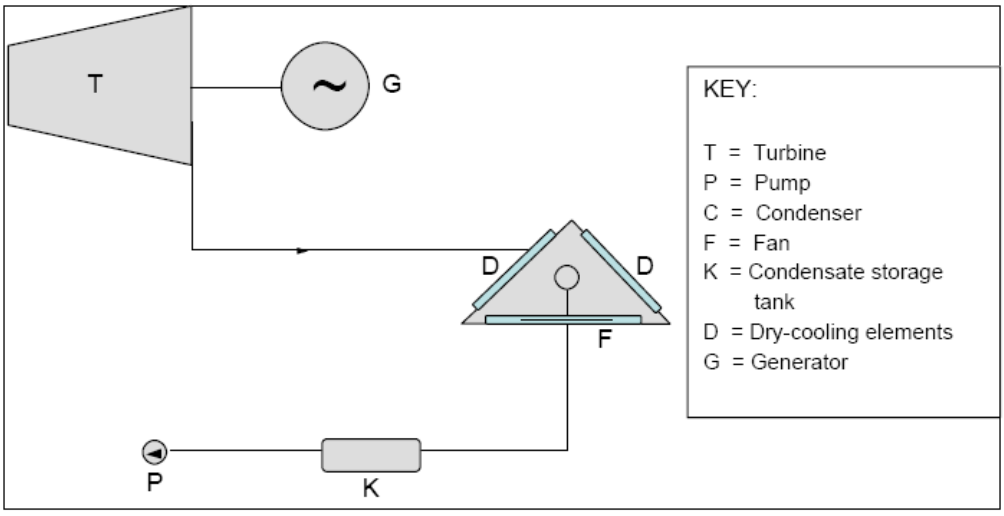

Figure 6.1 Showing a direct dry cooling system

Indirect dry cooling systems have a condenser and turbine exhaust system as for wet systems, with the circulating water being passed through finned tubes in a natural draught cooling tower. The water pipework allows the towers to be sited away from the station. The indirect system also uses a cooling tower and water (see Figure 6.2). Heat is conducted from the water through the “A – frame” bundles of cooling elements arranged in concentric rings inside the tower. The cooling water flows through these elements, cools down as the cold air passes over them and returns to the condenser. This is referred to as a closed system as there is no loss of water due to evaporation.

Eskom embarked on the direct and indirect dry cooling systems in its endeavour to conserve the county’s limited water supplies. Although the expense involved in the construction and operation of a dry cooling system is greater than a conventional wet cooling system, depending on availability water resources may influence any such in determining the choice between the two technologies.

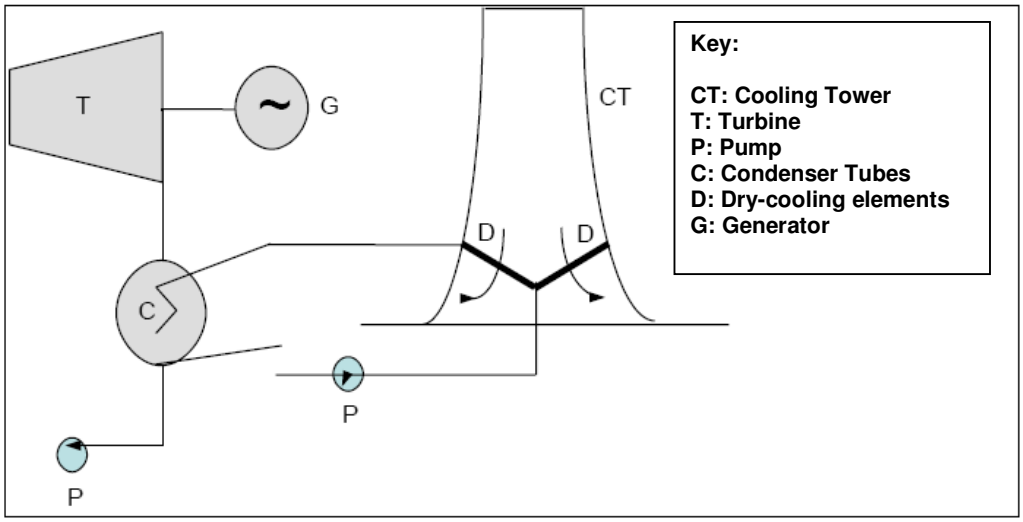

Figure 6.2 Showing a typical indirect dry cooling system

Eskom is currently investigating which dry-cooling system will be utilised at the proposed CCGT power plant.

6.5.2 Air Quality Abatement Technologies

The CCGT is considered cleaner burning technology, although some emissions such as oxides of sulphur, oxides of nitrogen and greenhouse gases (e.g. carbon dioxide) may be emitted. The proposed CCGT power plant will have appropriate air quality abatement technologies to comply with relevant applicable air quality legislation. To this end, various air quality abatement technologies will be investigated as part of the EIA phase.

6.6 Pipeline Alternatives

6.6.1 Fuel Supply Pipeline

Fuel supply will be provided in the form of a high quality burnable gas. The fuel pipeline transportation routes have not been determined at this stage, but will be identified, in the form of corridors, and addressed in the EIA phase of the project.

6.6.2 Water Supply Pipeline

Water supply to the CCGT power plant will be *via* a pipeline from the quota allocated to the existing coal-fired Majuba Power Station. The exact length and route of the alignment of the proposed pipeline is not known at this stage although it is envisaged that this pipeline would not be more than 10 km in length. Some water may also be sourced from the Rietpoort

Balancing dam. A more detailed description and assessment of proposed alignments will follow in the EIA phase, in the form of corridors, from the sources of water to the point of usage.

6.7 Alignment of Access Roads

Both existing and new access roads will be used or constructed, respectively to link the proposed CCGT power plant with the existing transport network. The alignment of these access roads will be inclusive of temporary and permanent roads. Details regarding the various access road alignments or corridors are not available at this stage of the process but will be designed at a later stage and used to inform the EIA phase studies.

6.8 Construction Village

A construction village will either be established or the existing mine hostel or construction village used to house workers for the construction of the Majuba Power Station could potentially be used to accommodate the construction crew. The exact positioning of the construction village is not decided at this stage but will form part of the layout to be designed. However, impacts associated with the construction village will be studied at the EIA phase.

7. POTENTIAL IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

The proposed CCGT power station and associated infrastructure are anticipated to impact on a range of biophysical and socio-economic aspects of the environment. One of the main purposes of the Environmental Impact Assessment (EIA) process is to understand these potential impacts and to determine if they can be minimised or mitigated. The Scoping Phase describes the full range of potential impacts and then proposes, based on a clear motivation, which impacts should be considered in detail in the EIA Phase, and which should be scoped out at this stage. Those scoped out at this stage are addressed at Environmental Management Plan stage to ensure that their mitigation is captured at project implementation.

7.1 CONSTRUCTION PHASE IMPACTS

These are impacts on the bio-physical and socio-economic environment that would occur during the construction phase of the proposed project. They are inherently temporary in duration, but may have longer lasting effects e.g. pollution of a wetland during construction could have effects that may last long after construction is over. Construction phase impacts could potentially include:

- Disturbance of flora and fauna;
- Impacts on water resources;
- Increase in traffic volumes in the vicinity of the construction site;
- Windblown dust;
- Noise pollution; and
- Litter/ waste pollution.

Based on the temporary duration of the construction phase and the fact that negative impacts of construction can be readily predicted and mitigated, generally speaking, more attention will be given to the operational phase impacts of the proposed power station than to the construction phase impacts. However, wherever relevant, specialist studies would consider construction phase impacts, and in certain cases, would be focused on construction phase impacts e.g. impacts on terrestrial flora and fauna are mainly construction phase impacts.

It should be noted that a comprehensive construction phase Environmental Management Plan (EMP) would be developed and implemented to regulate and minimise the impacts during the construction phase.

7.2 OPERATIONAL PHASE IMPACTS

Given their long term nature, operational phase impacts will come under close scrutiny in the EIA Phase of this EIA. The specialist studies will identify and assess the implications of these impacts and include measures to minimise predicted impacts. The assessment of potential impacts will help to inform Eskom's selection of preferred alternatives to be submitted to the Department of Environmental Affairs and Tourism (DEAT) for consideration and approval. In turn, DEAT's decision on the environmental acceptability of the proposed project and the

setting of any conditions will be informed by the specialist studies, amongst other information to be contained in the EIR.

It is normal practice that, should the proposed power station and associated infrastructure be authorised, the development and implementation of an operational EMP is required. The operational EMP is designed to mitigate negative impacts associated with the operational phase of the project and will be informed by the mitigation measures proposed by the specialists and their feasibility.

7.3 SPECIALIST STUDIES

As required by the Call for Proposals put out by Eskom when embarking on the EIA process, Bohlweki-SSI Environmental formed a team with a suite of specialist consultants in various disciplines. As part of the scoping exercise, the team of specialists attended a site visit and workshop to determine if, on the basis of a literature review and the site inspection, the scope of their work as originally envisaged could be reduced, or whether it needed to be expanded or amended. The outcome of the workshop was that, while some impacts might have been considered to be relatively benign, best practice and a need to fully understand the implications of the proposed project, warranted that further investigation of all identified issues be undertaken in the EIA Phase. Accordingly, the following specialist studies and specialists are proposed to be undertaken in the EIA Phase (see Table 7.1 below):

Table 7.1 Specialist studies to be undertaken in the EIA phase

Air quality impacts	Bohlweki-SSI Environmental
Noise impacts	Jongens Keet Associates
Visual impacts	MetroGIS
Impacts on flora and fauna	Bathusi Environmental Consulting
Impacts on aquatic ecosystems	SiVEST Environmental
Groundwater impacts	SRK Consulting
Risk assessment	Riscom
Heritage impacts	Dr Johnny van Schalkwyk
Impacts on agricultural potential	Terra Soil Science
Socio-economic impacts	MasterQ Research
Planning impacts	Bohlweki-SSI Environmental
Traffic impacts	SSI Engineers and Environmental Consultants

Each of the specialists has the relevant experience and expertise to undertake the proposed studies.

A description of each of the proposed specialist studies follows. A methodology that was followed at scoping phase, and a draft Terms of Reference for each of the specialist studies is provided in this chapter (as well as in the draft Plan of Study for EIA (PoSEIA) in Appendix J. As a critical step in the EIA process, it is important that the public has the opportunity to comment on, and the authorities approve of, the proposed approach to the EIA Phase.

Commenting on the PoSEIA allows for this and ensures that the proposed approach, including the scope of work for the specialists, is informed by public and the authority feedback in order to ensure that the work produced addresses the issues of concern at the requisite level of confidence. A robust basis for informed debate and decision making is thus provided.

Key outcomes of the specialist studies would be information which will allow I&APs to engage in informed debate on the implications of the proposed project and will allow Eskom to make an informed decision on the preferred site, layouts and various other alternatives. Eskom will also gain an understanding of the range and benefits of implementing possible mitigation measures.

7.4 Hydrogeology

7.4.1 Introduction

Bohlweki-SSI Environmental appointed SRK Consulting to undertake the necessary hydrogeological studies for the proposed Combined Cycle Gas Turbine (CCGT) power plant. SRK have compiled a Screening report (SRK Report Ref. 378710, dated 24 October 2007), Hydrogeology Scoping Report (SRK Report Ref. 378710GW, dated January 2008), and a Candidate Site report – Hydrogeology (SRK Report Ref. 378710GW2, dated May 2008). The reports identified and evaluated possible suitable sites for the CCGT plant from a hydrogeological perspective.

7.4.2 Methodology

SRK undertook a literature review after visiting the sites during the Screening phase. The desktop study allowed for the collection of information, which allowed for an assessment of potential impacts on the hydrogeology and the compilation of the candidate site assessment reports. These data were assessed to enable SRK to address the hydrogeological aspects of the proposed power generation project, which includes a detailed risk assessment with regards to potential impacts associated with the proposed CCGT and ancillary infrastructure on the water environment.

The project methodology allowed for a literature review, data compilation and assessment, site selection, and EIA scope of work recommendations.

7.4.3 Potential Impacts on Hydrogeology

The possible sources of contamination or infrastructure that may impact on the groundwater resources include:

- The raw water dams - source of artificial recharge to the groundwater
- Water (neutralised) storage tanks – possible source of artificial recharge
- The sewage plant and dams – seepage or irrigation of effluent may impact on groundwater

- Treated (demineralised) water system – resultant wet waste brine may impact on groundwater
- Recovery (dirty water) dams – overflow, seepage, or irrigation may impact on groundwater
- Fuel oil and stored chemicals - oil / chemicals enters water and requires treatment
- Solid waste site - source of leachate or poor quality water
- Borrow pits – reduced runoff and enhanced recharge
- FGD technology – wet waste and water use
- Some sections of the operations plants, e.g. workshops, batching plants, etc.

The impacts are thus related to potential artificial recharge, causing increased groundwater levels, changes in groundwater flow patterns, and the potential to cause deterioration of groundwater quality with time.

Based on the available data and envisaged impacts on the groundwater resources, the following issues should be taken into consideration when assessing site suitability:

- The CCGT power plant and ancillary infrastructure can potentially impact negatively on the groundwater. The site should, therefore, be located in an area with limited groundwater resources and potential (if possible);
- Where there is are groundwater resources, the study will advise on extraction of this water and its impact on the receiving environment, including any wetlands in the area;
- Artificial recharge can increase groundwater levels directly adjacent to the water impoundments associated with power generation. Groundwater levels can become elevated because of infiltration;
- Pollution plumes are envisaged to only extend over small areas / distances (hence they may have a long residential time at a point, which poses a risk at the area of impact as dilution factors are also low) if the CCGT is located on a non-aquifer system.
- Persistent sources of contaminants can alter the hydrochemistry, causing an increase in dissolved solids and metals. The sources must, therefore, be located within areas where groundwater usage or potential for use is reduced.
- Undertake necessary modeling to advise of upstream impacts and downstream impacts from the station.
- Undertake a hydrocensus of the area

7.4.4 Conclusions and Recommendations

It is envisaged during the EIA study additional site-specific groundwater data will be compiled. The data will be obtained from a hydrocensus on the selected sites. It is proposed that due to lack of hydrochemical data, groundwater samples will be collected from existing boreholes, where possible.

Groundwater levels, borehole yields, and usage will be determined to assist in assessing possible impacts on the groundwater resources.

This data plus additional CCGT details will be compiled in a detailed hydrogeological study (a risk assessment) to aid in developing optimal mitigation and management plans to reduce the impact of the CCGT power plant on the groundwater regime.

In addition:

- A model providing the flow patters will be provided to advise on both 'pre-station' and 'post-station' impacts.
- Appropriate mitigation measures will be proposed and
- A recommendation of the most preferred site as far as this specialist field is concerned will be made.

7.5 Hydrology

7.5.1 Introduction

Bohlweki-SSI Environmental appointed SRK Consulting to undertake the necessary hydrological studies for the proposed CCGT power plant in the Amersfoort area, Mpumalanga Province. SRK Consulting has compiled a Screening report (SRK Report Ref. 378710, 24 October 2007).

The desk-top assessment of suitable sites was based on surface water resources (rivers, streams, dams), vulnerability to potential surface contaminant sources (surface runoff from industry and disturbed areas due to infrastructure due to the drainage density), slope (erosion problems due to steep slopes), problems associated with water supply to the power station, existing land use areas and sensitive areas (wetlands).

7.5.2 Methodology

SRK undertook a literature review after visiting the sites during the Screening phase. The desktop study allowed for the collection of information, which allowed for an assessment of potential impacts on the hydrology and the compilation of the candidate site assessment reports. These data were assessed to enable SRK to address the hydrological aspects of the proposed power generation project, which includes a detailed assessment with regards to potential impacts associated with the proposed CCGT and ancillary infrastructure on the water environment.

The project methodology allowed for a literature review, data compilation and assessment, site selection, and EIA scope of work recommendations.

7.5.3 Potential Impacts on Hydrology

The potential impacts on hydrology include:

- possible flooding;
- possible pollution from station activities;

- increased runoff from disturbed areas and infrastructure;
- generation and transport of domestic and industrial waste;
- availability of water to the CCGT power plant (be more suitably approached in the EIA phase); and
- water supply demands to environment and other water users satisfied (be more suitably approached in the EIA Report);

7.5.4 Conclusions and Recommendations

Recommendations included that the sites must not be in close proximity to wetlands (buffer distance of 50m in rural areas from the delineated boundary) as well as in areas of high drainage density (exacerbates the potential problems of pollutants and increased erosion). The sites should be situated on denuded vegetation than on more sophisticated land uses such as irrigated or agricultural land.

It was further recommended that a full EIA study be done. This process will entail a thorough examination of the sites, and from a hydrology perspective, making informed assessments as to the repercussions of the proposed CCGT power plant on the surface water resources locally and regionally with a view of both the primary and secondary effects.

The plan for the EIA study from a hydrological viewpoint should entail the following:

- site visit to assess local hydrology;
- review water supply details to the CCGT plant – inter-catchment transfer schemes taken into account and incorporating an accurate water balance for the plant;
- assessing the local climate;
- pre- and post development description of the hydrology, focussing on mean annual runoff, peak flows and volumes, drainage density and water quality studies including sampling and utilising the DWAF databases;
- assessing the local infrastructure, including the dams in the vicinity, their size, their specific water uses and what the probability of breaking or not with the increased water supply needed in the area. The dams supplying the CCGT plant will be included in the water balance as well. The dams will need to be assessed in terms of the long term impacts, with the dam being required to be fuller, of the increased discharge from the dam. The infrastructure will also include what stormwater management systems would have to be implemented to contain stormwater flows in accordance with Regulation 704 of the National Water Act, 1998;
- controlling erosion, pollutants as well as industrial and domestic waste;
- assess if there are any fatal flaws or environmental conflicts; and
- the downstream water users would need to be considered in terms of water availability, water quality and their ability to continue with their livelihoods
- recommend the most preferred site; and
- provide mitigation measures

7.6 Biodiversity

7.6.1 Introduction

Bathusi Environmental Consulting has been appointed, on behalf of Bohlweki-SSI Environmental (Pty) Ltd to conduct a biodiversity screening assessment for the proposed construction of the CCGT power plant and associated infrastructure in the Amersfoort area.

The biodiversity screening assessment aims to provide a broad description of ecological attributes of the study area that could potentially be affected by the proposed construction of the CCGT plant and associated infrastructure.

7.6.2 Methodology

- ***Habitat Diversity & Variations***

The vegetation assessment is based on a variation of the Braun-Blanquet method whereby vegetation is stratified on aerial images with physiognomic[2] characteristics as a first approximation. These initial stratifications will be surveyed for floristic and environmental diversity during the EIA investigation and subjected to a desktop analysis to establish differences/ similarities between observed units.

A site survey was conducted on the 6th June 2008 and cognisance was taken of the following environmental attributes and general information:

* biophysical environment, i.e. geology, land type units, topography, etc that is generally accepted to be driving forces behind vegetation development; including:
  - slope;
  - aspect;
  - topography; and
  - rockiness
* holistic/ regional vegetation;
* the current status of available habitat forms;
* Red Data habitat suitability; and
* Sensitive ecological areas (outcrops, riparian fringes, non-perennial streams, river, etc.).

- ***Red Data Probabilities***

Baseline PRECIS data obtained from SANBI was utilised to compile a list of Red Data flora species that could potentially occur within the study area.

Three parameters were used to assess the Probability of Occurrence for Red Data species:

[2] Physiognomy refers to the visual appearance of vegetation in terms of different growth classes, biomass, height, etc.

* Habitat requirements (HR) - Most Red Data species have very specific habitat requirements and the presence of these habitat characteristics in the study area is evaluated.
* Habitat status (HS) - The status or ecological condition of available habitat in the study area is assessed. Often, a high level of degradation of a specific habitat type will negate the potential presence of Red Data species (especially wetland-related habitats where water quality plays a major role); and

* Habitat linkage (HL) - Movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to surrounding habitats and adequacy of these linkages are evaluated for the ecological functioning of Red Data species within the study area.

7.6.3 Habitat Types of the Study Area

The following ecological habitat types occur in the study area (refer to Figure 7.1 overleaf):

- Cultivated Fields;
- Natural Grassland;
- Riparian Habitat; and
- Transformed Areas.

- ***Cultivated Fields***

These areas comprises lands that are currently actively cultivated for crops, areas where the grass layer has been altered as well as areas where agricultural activities has ceased some time ago, but the vegetation still reflects the impact of transformation. The vegetation in these parts is entirely compromised and will not recover to a status that approximates the natural regional vegetation. A low ecological status is attributed to these areas.

- ***Natural Grassland***

The natural grassland of the study area is characterised by a short, low cover of herbaceous species and the absence of woody species. The ecological status of these areas is determined by the intensity of grazing by cattle and sheep. In areas where high grazing pressure predominate the vegetation is dominated by the grasses *Eragrostis plana* (Tough Love Grass)*, E. chloromelas* (Curly Leaf)*, Cynodon dactylon* (Couch Grass) and the forbs *Cirsium vulgare* (Scotch Thistle)*, Berkheya pinnatifida, Alternanthera pungens* (Khaki Bur Weed). and *Crepis hypochoeridea.* The species diversity in these parts is frequently low.

The ecological status of these areas are frequently not as well-defined as indicated in the description, but more often represent a gradient of grazing pressure. However, even areas that were subjected to high grazing pressure are different to transformed areas by the simple distinction that these areas are able to recover to a natural status under correct management. A medium-high ecological status is attributed to this variation.

- ***Riparian Habitat***

Non-perennial streams occur within the study areas as well as in the immediate vicinity thereof. The ecological status of these areas is regarded medium-high. Negative impacts are noted that affect the status of these areas adversely, including damming of upstream catchment areas, high utilisation factors, adjacent industrial activities. Trampling of the topsoil as well as infestation of the streambed by terrestrial species, imported by means of droppings and physical transportation methods, result in species changes in selected areas.

In a pristine status these areas would be dominated by a dense grass layer and diverse herbaceous composition. Depending on the riparian characteristics (streambed, stream banks, valley bottom, levee area, seasonal pan, etc.) the vegetation composition might be dominated by hydrophilic species or grass and forb species that are adapted to permanent or temporary inundation with water. Soils in these areas are frequently high in clay content. The vegetation that characterise these parts are therefore highly palatable and normally targeted by cattle, resulting in frequent degradation.

Taking the Red Data plants and animals that occur in the region into consideration, these areas are highly suitable for the potential present of these species. The ecological status of this habitat type is considered to be medium-high, but high utilisation contributes to degradation.

- ***Transformed Areas***

This habitat type represents areas where historical or recent human activities led to transformation of the natural vegetation. No natural vegetation remains in these areas and the floristic status of these areas is therefore regarded low as a result of the secondary vegetation that characterises this community.

The likelihood of encountering Red Data species within these areas are regarded low.

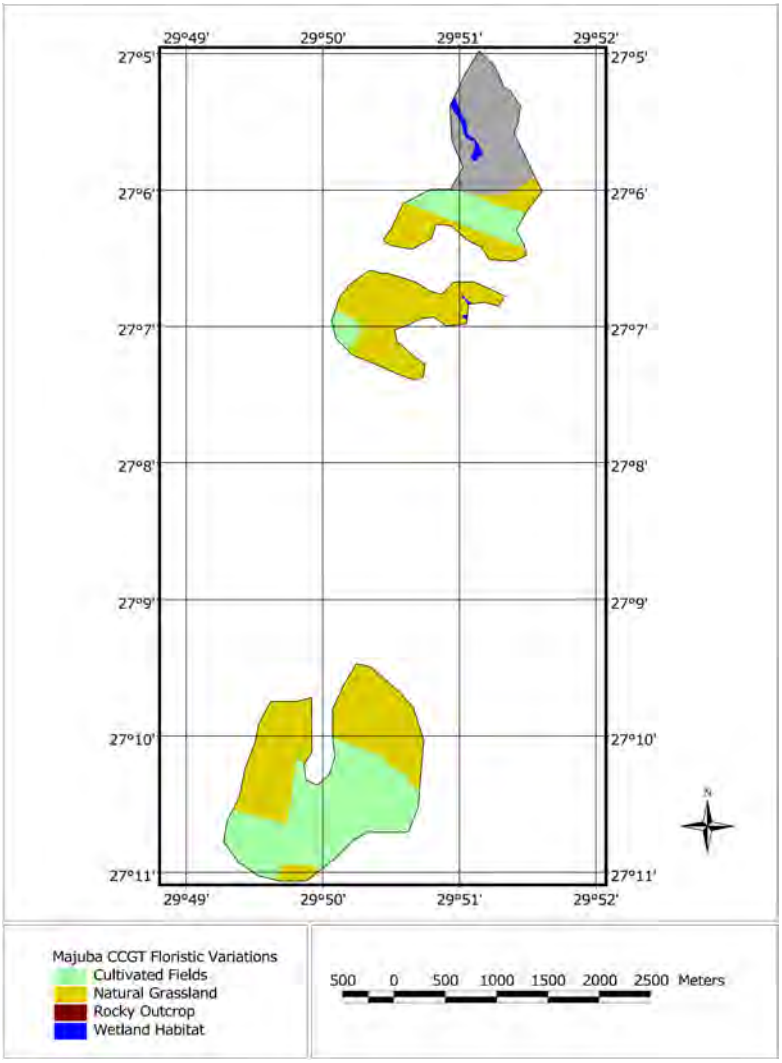

Figure 7.1 Habitat type of the study area

7.6.4 Potential Impacts on Biodiversity

The following impacts were identified that could potentially affect the biodiversity of the study area adversely:

- *Potential destruction of threatened species and habitat*
  The loss of threatened/ protected species or habitat that is regarded suitable for these species is a significant impact on the biodiversity of a region. Threatened species, in most cases, do not contribute significantly to the biodiversity of an area in terms of sheer numbers as they generally occur in low numbers, but they are extremely important in terms of the biodiversity of an area and a high conservation value is placed on the presence of such species.

  Threatened species are particularly sensitive to changes in their environment, having adapted to specific habitat requirements. Habitat changes, mostly a result of human interferences and activities, are one of the greatest reasons for these species having a

threatened status. Significant surface transformation resulting from the proposed activity will lead to changes that will affect these habitats adversely. Effects of this impact are permanent and recovery or mitigation is generally not perceived as possible.

It should be noted that the estimated presence of Red Data flora and fauna species for the area is regarded highly likely, particularly in the wetland habitat types. Significant impacts on potential communities of Red Data species are therefore regarded likely to happen.

- *Potential destruction of sensitive habitat types (outcrops, riparian fringes, non-perennial streams, river, etc.)*
  Sensitive habitat types include ridges, outcrops, riparian habitat and localised floristic variations of significant physiognomic variation and species composition. These areas represent centres of atypical habitat and comprising biological attributes that are not frequently encountered in the greater surrounds. A high conservation value is attributed to the floristic communities of these areas as they contribute significantly to the biodiversity of a region.

- *Potential destruction of pristine[3] habitat types*
  Large portions of the study area comprise natural grassland habitat that is regarded moderately pristine, representing the Amersfoort Highveld Clay Grassland (Mucina and Rutherford, 2006). The conservation status is regarded as Vulnerable, with a target of 27%. None is however formally protected. Some 25% of this unit is transformed, predominantly by cultivation (22%). The area is not suited to forestation. Extensive parts of this vegetation type were once cultivated and now lie fallow and have been left to re-vegetate with pioneer grass species.

  The study area is situated with the African Grasslands/ Ekengela Initiative Transition Zone, rendering all areas of natural grassland sensitive (ENPAT, National Database, Biosphere). The loss of pristine natural regional habitat represents loss of habitat and biodiversity on a regional scale. This impact is regarded permanent.

- *Potential changes to habitat diversity and biodiversity*
  Transformation of grassland habitat during the construction process will inevitably result in the creation of atypical and artificial habitat types that are not considered representative of the regional vegetation. Due to the severity of transformation, surrounding areas are frequently invaded by shrubs and alien species not generally associated with the area.

- *Potential impacts on surrounding natural habitat and species*
  Surrounding areas and species present in the direct vicinity of the development could be affected by impacts resulting from construction and operational activities. These impacts could include all of the above impacts, depending on the sensitivity and status of surrounding habitat and species as well as the extent of impact activities. Areas that

[3] Pristine habitat in this report implies natural habitat that are considered to be in a climax status, while natural vegetation refers to untransformed vegetation, that might be slightly degraded, but with a high likelihood of recovery to a pristine condition under correct management strategies.

are particularly prone to this impact include riparian zones where impacts that affect the water quality results in impacts further downstream.

7.6.5 Conclusions and Recommendations

Transformed areas and cultivated fields do not contribute significantly to the sustainability of biodiversity in the study area and surrounding regions. They are considered to have low ecological sensitivity and further transformation of these areas are not expected to have a significant impact on any floral or faunal species, assemblage or communities found in the study area or surrounding regions.

The remaining two habitat types (natural grassland and riparian) have significant ecological and biodiversity value; natural grasslands and wetlands are mostly untransformed and are likely to harbour ecologically sound and significantly unique animal assemblages and communities. The natural grassland of the study area is considered to have a moderate ecological sensitivity. It is reasonably well-represented in the general region. Many of the Red Data species listed for the region as having a moderate likelihood of occurring in the study area are expected to be present in the natural grassland of the study area.

Wetland areas are present within the respective study areas. A high ecological sensitivity is nonetheless attributed to these parts. Factors that contribute to this high sensitivity include the uniqueness of habitat type, its' linear nature and the degree of stenotopy[4] of the animal species usually found in wetlands. In other words, most of the animals that are wetland-associated are not found anywhere else. Large groups such as the Anatidae (ducks) and Amphibia (frogs) are limited to wetlands and will disappear from the area if wetlands are transformed.

7.7 Soils and Agricultural Potential

7.7.1 Introduction

Soil surveys are intensive exercises and, in order to be considered accurate and representative of s specific area, require detailed field investigations. This study is conducted at a Scoping level and as such does not consist of detailed field investigations. The approach followed with a Scoping study is to compile available information as well as to conduct limited field verification of the available data. Additional resources such as aerial photographs and satellite images area used to generate site specific information.

[4] Stenotopy is a characteristic that certain species exhibit in their habitat range they occupy. Species that have a narrow habitat range is said to have a high stenotopy, such as water fowl, amphibians, etc. Other species are holistic in habitat preferences and can occupy a wide variety of habitat types, like Turtle doves that occur in grassland, woodland, forest, etc.

7.7.2 Methodology

The Scoping survey for the sites was conducted in three phases.

- **Phase 1: Land Type Data**

Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 – 2006). The land type data is presented at a scale of 1:250 000 and entails the division of land into land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units (in the cross section). The soil data is classified according to the Binomial System (MacVicar et al., 1977). The soil data was interpreted and re-classified according to the Taxonomic System (MacVicar, C.N. et al. 1991).

- **Phase 2: Aerial Photograph Interpretation**

The most up to date aerial photographs (satellite imagery) of the site proved to be the Google image and this image was therefore used to interpret aspects such as land use and land cover as well as historic land uses such as cultivation.

- **Phase 3: Limited Field Verification**

A general site visit was conducted to confirm information generated during the two previous phases (above) of the survey.

7.7.3 Potential Impacts on Soil and Agricultural Potential

Construction activities will entail removal of soil for the building of structures and foundations as well as vehicle movement and informal and temporary dumping sites. All areas impacted by building activities will be disturbed and it is highly unlikely that the soils could recover to pre-disturbance conditions.

From the limited field investigation as well as the land type data the soils on the sites are not categorised as prime agricultural/crop production soils. The reason for this statement is that the soils tend to be shallow to moderately deep only and that there seems to be significant variation in soil characteristics in the landscape. The surrounding areas have distinct cultivated fields that would indicate the presence of suitable soils in the general area. It can be assumed that if the soils on the sites are not actively cultivated that they are not economically suited to such uses. The interpretation is therefore that the sites cannot be classed as high agricultural potential but rather as **moderate agricultural potential with limitations**.

From the gathered data the current land use appears to be grazing. If this is the case it confirms the interpretations presented above.

7.7.4 Conclusion and Recommendations

The three potential sites for the development of the CCGT power plant fall into the same land type (Ca2 – Land Type Survey Staff, 1972 – 2006) and similar landscape positions. The conclusion is therefore that the sites are very similar in terms of soils, land capability and agricultural potential. From aerial photograph interpretation it appears that the land use on the three sites are similar (grazing with sections of potentially improved grassland). Site 2A already has some infrastructural developments on it and therefore has been impacted to a degree that the other sites have not. A limited field verification of the soil conditions in the general area confirmed the data extracted from the land type information.

Even though the sites are very similar in most characteristics, the preference for site 2A stems from the fact that it has already been impacted to a degree and that overall impacts in the area can be minimised through the alteration of existing infrastructure rather than impacting new (natural) areas.

The above conclusions can only be verified and strengthened through a detailed survey that will form part of the EIA phase of the project.

7.8 Wetlands

7.8.1 Introduction

SiVEST Environmental have been appointed by Bohlweki-SSI Environmental to undertake a scoping-level wetland assessment study as part of the wider Environmental Impact Assessment (EIA) studies for the proposed Combined Cycle Gas Turbine (CCGT) power generation plant near the Majuba Power Station in the Amersfoort area of Mpumalanga. The scoping-level impact assessment assessed the three proposed sites for the location of the proposed plant. The wetland assessment also identified the presence/absence of wetlands on/adjacent to each of the three sites and assesses the potential impact of the proposed development on the wetlands on the sites.

7.8.2 Methodology

The first step of the Scoping Phase wetlands assessment methodology was the identification and delineation of wetlands on and adjacent to the three sites selected for the scoping assessment. This was undertaken in ArcView GIS, using orthophotos of the study area provided by the project proponent as a basis to identify wetlands. On the orthophotos, wetland vegetation appears as a different hue (being darker) than the grassy vegetation in the surrounding non-wetland grasslands, thus allowing wetland vegetation to be demarcated. The occurrence of wetland grassland as apparent on the orthophotos was used to mark the boundaries of the wetlands. A buffer around the areas of darker wetland vegetation was included within the wetland boundary to represent the temporary wetland zone – the boundary zone between the seasonally/permanently wet parts of the wetland and the surrounding non-wetland grassland.

The findings of the earlier on-site wetland delineation, undertaken on sites to the west of the current scoping sites were used to 'calibrate' and to refine the findings of this desktop delineation of wetlands. A GIS shapefile was created to represent the boundaries of the delineated wetlands. The boundaries of the wetlands are represented in Figure 7.2 – 7.4. A 50m-wide buffer zone beyond the boundaries of the wetlands was also delineated, and is indicated in Figures 7.2 – 7.4. The hydro-geomorphic form of wetland units on / adjacent to the three proposed sites was also identified.

Once the wetlands on and adjacent to the three sites had been delineated, the impact of the proposed plant on the wetlands was undertaken. The assessment of impact was limited to the potential loss of wetlands that may be located within the plant footprint Potential impacts related to the placing of associated infrastructure such as pipelines and roads through wetlands in the vicinity of the sites have also been assessed.

7.8.3 Potential Generic Impacts on Wetlands

The general nature of impacts on wetlands relating to the transformation of land within the physical footprint of the proposed plant is discussed prior to the discussion of site-specific impacts. If the plant and associated infrastructure is located within a wetland, then the assumption has been made that the wetland is likely to be completely transformed, resulting in the complete loss of wetland habitat as well as functionality of the affected part of the wetland (and possibly the functionality of the downstream portion of the wetland). Wetland functionality can be divided up into a number of components including ecological value, hydrological functioning, water quality enhancement and socio-economic functionality, amongst others. All of these functions are intrinsically related to, and are dependent upon the physical components of the wetland, including the soils and vegetation contained within the wetland as well as other biotic components that are adapted to life within wetlands.

The presence of these biotic components is in turn closely related to the nature of the hydrology of the wetland, which in the hydro-geomorphic forms found in the study area is characterised by the retention of, and diffuse flow of water through the wetland in the case of valley bottom wetlands, or the interface with groundwater (discharge) in the case of hillslope seepage wetlands. The combination of the hydrology, hydromorphology and biota (especially vegetation) within the wetland allow certain chemical and ecological processes to occur that provide much of the wetland's functionality. If the physical characteristics of the wetland are transformed, or destroyed, the hydrology, hydromorphology and ecological assemblages within the wetland will typically be altered. The resulting impact is the loss/destruction of functionality and value of the wetland. If a development is built upon a wetland, the loss and destruction of the wetland and associated impact on functionality is often complete and irreversible. It has been assumed that this level of impact will result in the case of the proposed development if plant infrastructure is located within wetlands.

- ***Impacts related to Pipelines***

Very limited information is available on the gas pipeline from the adjacent gas cleaning plant to the CCGT power plant and the proposed water supply pipeline from the Rietpoort Balancing Dam (for construction and operational water supply) will. If the pipelines are placed

above ground, they may affect wetlands, as they would need to cross the wetlands and the support structures for the pipeline may need to be placed within the wetland, however, this can be avoided by placing support structure outside the wetland.

Other potential impacts relating to the construction and operation of pipelines through wetlands are:

- The pollution of water within the wetland, through construction activities, or through a spill once the pipeline becomes operational;
- The incorrect re-instatement of wetland vegetation that may result in the exposing and erosion of wetland soils,
- The compaction of wetland soils through the use of machinery in the wetland.

All wetland / river crossings would need to be licensed under Section 21 of the National Water Act (36 of 1998).

- ***Impacts related to Access Roads***

Access roads, like pipelines may also need to cross wetlands, especially if the plant is located at Site 4 that is effectively completely surrounded by wetlands. The potential impacts of access roads on wetlands are similar to the impacts associated with pipelines, but the primary potential impacts on wetlands are:

- The alteration of the hydrology and hydromorphology of the wetland due to the placing of the road in the wetland; if too few culverts are placed under the road, the road will act as an impoundment.
- The physical disturbance of wetland soils and vegetation by construction activities that may lead to erosion of wetland soils.
- The introduction of pollutants and other toxicants into the wetland from stormwater off the road that carries fuel / oil spilt onto the road surface.

- ***Other Generic Impacts***

The water treatment and sewage treatment plants may be associated with discharge of water into the wetlands and drainage systems, however, the project will be designed to comply with Eskom's zero effluent philosophy. However no technical information on the nature and output of these processes has been provided. Certain aspects of the infrastructure are associated with the storage and use of hazardous materials. If these enter the wetland systems or groundwater, these pollutants could result in a highly negative impact on the wetlands and the water quality and biota within the downstream system. However it is assumed that stringent measures will be taken to ensure that no spillages / leakages of these hazardous materials occur, thus entering the surrounding environment. For the rest of the infrastructure associated with the plant, the physical transformation of wetlands is the only potential impact that can be identified at this point due to a lack of technical information.

7.8.4 Potential Site-Specific Impacts on Wetlands

- ***Site 2A***

Like the other two sites, Site 2A is effectively surrounded on all sides by wetlands and drainage (see Figure 7.2 overleaf). Valley bottom wetlands are located adjacent to two parts of the site – to the east the primary valley bottom wetland into which all wetlands in the immediate catchment of the three sites drain, and to the south a valley bottom wetland that lies between Site 2A and 2B. Hillslope seepage wetlands are located to the east and west of the site. The westward-draining hillslope seepage wetland to the west of the site is located just outside of the site, but its buffer zone extends into the site. A number of eastward-draining hillslope seepage wetlands extend into the north-eastern and eastern part of the site. An old, apparently disused mine is located in the northern part of the site. From the orthophotos it appears as if the hillslope seepage wetlands in the northern half of the site have been transformed / degraded by these mining activities. These wetlands may be physically affected by the proposed development if it is located in the northern part of the site. As these wetlands have been classified as hillslope seepage wetlands, they are likely to be discharging groundwater into the drainage systems to which they are hydrologically connected.

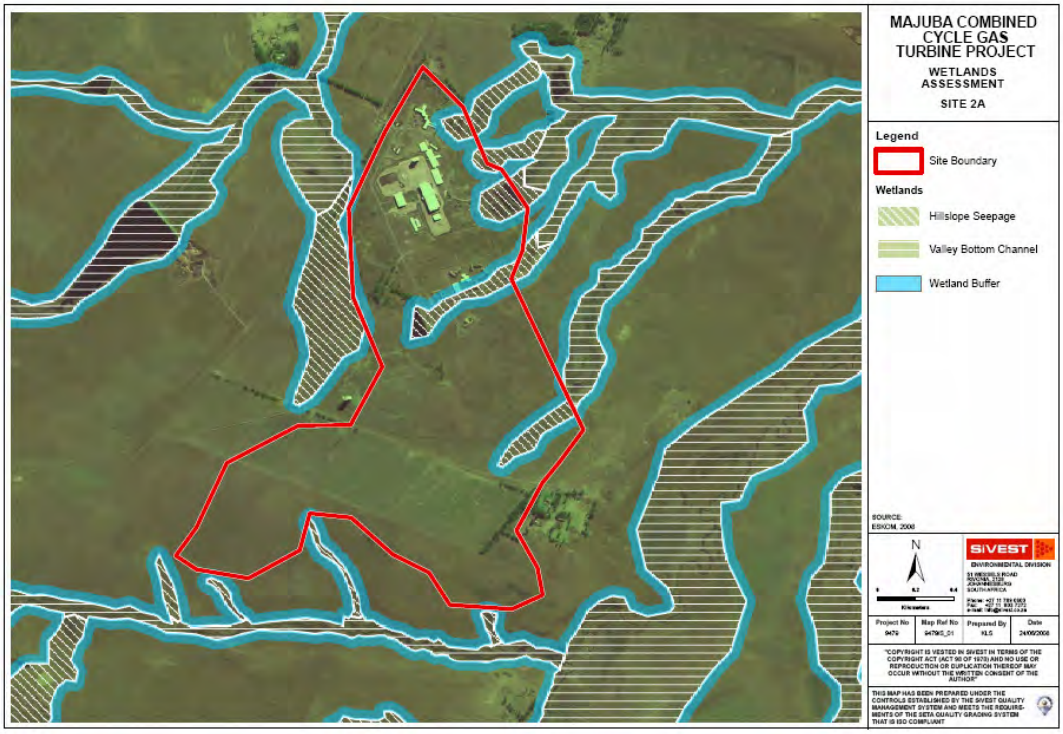

Figure 7.2 Desktop wetland assessment of Site 2A

- ***Site 2B***

Site 2B is almost completely surrounded by wetlands (refer to Figure 7.3). Valley bottom wetlands are located adjacent to three parts of the site – to the east the primary valley bottom wetland into which all wetlands in the immediate catchment of the three sites drain, to the

north a valley bottom wetland that lies between Sites 2A and 2B, and to the south another valley bottom wetland. Hillslope seepage wetlands are located to the east and west of the site. The northward-draining hillslope seepage wetland to the west of the site is located just outside of the site, but its buffer zone extends into the site. A number of eastward-draining hillslope seepage wetlands extend into the eastern part of the site. Due to the small size of the site compared to the other two sites, it appears likely that most of the area of the site would be utilised if this site was selected.

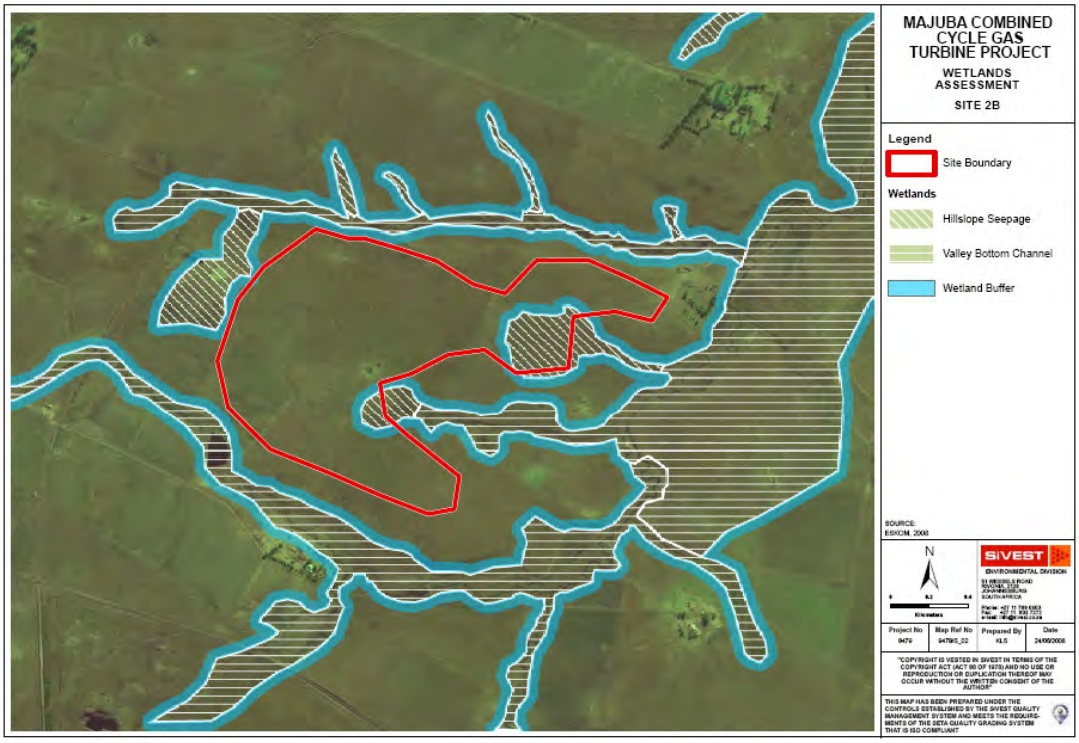

Figure 7.3 Desktop wetland assessment of Site 2B

There may be a higher risk that that the hillslope seepage wetlands extending into the eastern parts of the site may be physically affected by the plant footprint. The physical alteration of these wetlands would affect their and may affect the downstream wetlands and the input of groundwater into them. If these wetlands could be avoided, then it may be possible for no wetlands to be physically affected by the plant footprint, except for the pipeline and access roads as discussed below.

It is highly likely that the water and gas pipelines, as well as access roads would need to cross the wetlands located adjacent to the site. It would appear advisable to utilise the existing access road / track to the Rietpoort farmstead that crosses the northern-most part of the site as this road is associated with an existing wetland crossing.

- ***Site 4***

Site 4 is also completely surrounded by wetlands (refer to Figure 7.4). Valley bottom wetlands are located adjacent to all sides of the site. On the eastern and western boundaries of the site, the wetlands are located immediately adjacent to the site and in places the wetland

buffer zone extends into the site. The site boundaries have been altered to exclude a valley bottom wetland that drains from the northern part of the site. Should the plant and associated infrastructure be able to be located away from the boundaries of the site, especially in the northern parts of the site, it would appear as if no wetlands would be physically affected by the plant if it is located on Site 4. This would need to be verified however by on-site delineation conducted during the EIA phase of the project.

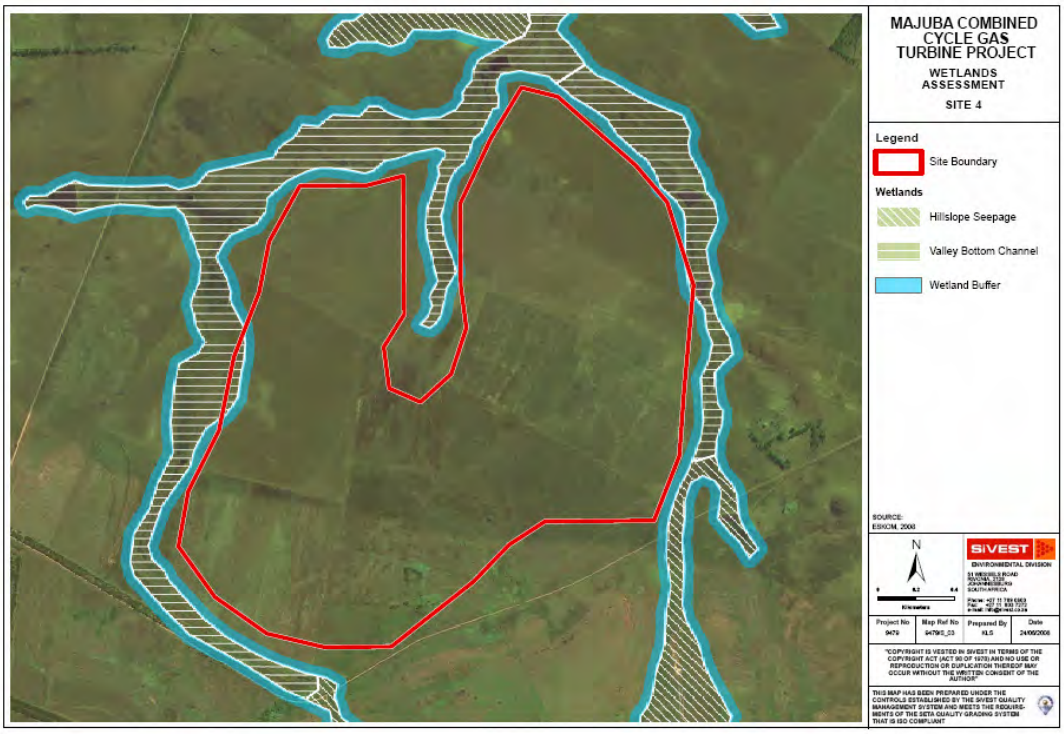

Figure 7.4 Desktop wetland assessment of Site 4

It is highly likely that the water and gas pipelines, as well as access roads would need to cross the wetlands located adjacent to the site due to the presence of wetlands on all sides of the sites. It would appear advisable to utilise the existing access road / track that is located just to the south of the site rather than creating new access roads.

7.8.5 Potential Fatal Flaws

It is difficult to assess whether any of the sites would be associated with fatal flaws relating to impacts on wetlands, as no detailed delineation of wetlands has been undertaken and limited information pertaining to the technical details of the plant and associated outputs have been provided. As described above, it appears as if wetlands on all of the sites will be able to remain physically 'unaffected' by the proposed development, as the sites would be able to accommodate the plant and associated infrastructure in non-wetland areas. If wetlands extending onto the sites and their associated buffers would be able to be avoided, then it would appear that these wetlands would remain unaffected by the plant and associated infrastructure.

This statement however is subject to a very strong caveat, as no information on the potential outputs of the process, and the layout requirements of the proposed plant have been provided by the project proponent. The assessment of no fatal flaws being associated with the proposed development at any of the sites is thus associated with a very low level of confidence; more information relating to the layout and structure of the proposed plant, information on the physical outputs of the process, as well as the results of a detailed on-site delineation of wetlands are required in order to assess with a sufficient level of confidence whether the development of the plant on the three sites is associated with fatal flaws.
The construction of a pipeline and access roads through wetlands is not expected to be a fatal flaw, provided construction and operation mitigation measures are implemented to ensure that potential impacts are minimised top acceptable levels.

7.8.6 Conclusions and Recommendations

The desktop level assessment has identified wetlands that are adjacent to most parts of the three sites in which scoping has being undertaken. Limited technical information has been provided on the outputs (emissions, waste streams etc.) of the proposed CCGT electricity generation process and the technical details of the plant structure and that of associated infrastructure. The assessment of potential impacts of the proposed development on the wetlands on and adjacent to the site has thus largely been limited to the assessment of impact relating to transformation of wetlands that may be located within the physical footprint of the plant. The potential impacts relating the construction of roads and pipelines have also been identified.

Bearing these limitations in mind, the three sites have been assessed in terms of the potential impact on wetlands. It would appear that if the plant and associated infrastructure could be located away from wetlands and associated buffers that occur within the site boundaries, the impacts of the proposed development on wetlands on the site would be able to be minimised. Due to the data deficiencies described above, and as this assessment has been conducted as a desktop assessment, these findings are associated with a low level of confidence, however, the ecological integrity of these wetlands will be classified in the EIA phase in order to inform the optimal layout of the CCGT plant.

In order to increase the confidence of this assessment of potential impacts of the proposed development on wetlands, more information pertaining to the structure and layout of the proposed development on each of the three sites as well as the outputs of the proposed process will need to be provided by the project proponent. A detailed on-site delineation and assessment of the wetlands occurring on the three sites as well as an assessment of the potential impact of the proposed plant on the wetlands utilising the technical information related to the plant that is currently outstanding will need to be undertaken in the EIA phase.

8. ASSESSMENT OF THE SOCIAL ENVIRONMENT

8.1 Air Quality

8.1.1 Introduction

The Air Quality Unit of Bohlweki-SSI Environmental was appointed to conduct an air quality impact assessment for the proposed Combined Cycle Gas Turbine (CCGT) power plant and associated infrastructure in the Amersfoort area, Mpumalanga Province. The current investigation aims to highlight the potential air quality impacts which may result due to the construction, operation and decommissioning of the CCGT power plant and its associated infrastructure. This assessment forms part of the Scoping phase and will thus only focus on highlighting/scoping issues related to air quality which need to be considered. During later stages of the investigation, a full impact assessment will be undertaken which will provide a better understanding of the magnitude of these impacts.

The terms of reference for the current investigation can briefly be summarised as follows:

- Baseline assessment of the study area which includes:
  - the determination of the dispersion potential for the area under investigation;
  - the identification of sensitive receptors; and
  - the identification of other pollution sources which may affect ambient air quality.

- Scoping study which includes:
  - the determination of the key aspects of air pollution that may result from the construction, operation, and decommissioning phases of the project; and
  - the overview of the potential impacts which could result due to the release of the identified priority pollutants.

8.1.2 Methodology

- ***Baseline Assessment***

During the baseline assessment, a qualitative approach was used to establish the possible air quality issues which may result from the proposed project. Meteorological data sourced from the South African Weather Services was used to determine the atmospheric dispersion potential of the area. During the detailed environmental impact assessment to be undertaken ambient monitored data will be sourced from the area, to inform the potential for cumulative impacts at the site.

Sensitive receptors in close proximity to the site were identified. This was undertaken using the 1:50 000 maps provided, as well as by using observations recorded during a site visit to the area. Similarly, other pollution sources in the area being investigated were identified using the 1:50 000 maps provided. A qualitative assessment of the impact of these sources has

been attempted, to establish the possible cumulative impacts which may result from the proposed project.

- ***Scoping Assessment***

During the scoping phase of this study, the key aspects of air pollution were identified and discussed for the construction, operational and decommissioning stages of the proposed project.

8.1.3 Baseline Assessment

- ***Wind***

For the proposed study area, both monitored meteorological data from the Underground Coal Gasification (UCG) plant and modelled data[5] from the South African Weather Services (SAWS) was made available. According to the SAWS modelled meteorological data, winds originate predominantly from the eastern and western sectors (Figure 4.4c – Chapter 4). Airflow in the study area is predominantly from the east (~15% of the time). From the eastern vector wind speeds of between 3.7 and 5.8 m/s occur most of the time (~6%). Wind speeds between 5.7 and 8.8 m/s also occur, but less frequently (~2%). Winds are westerly ~12% of the time, with the wind speed most frequently between 3.8 and 5.7 m/s (~4%). Wind speeds of greater than 8.8 m/s are also experienced infrequently in association with wind from the west. According to the frequency distribution graph presented in Figure 4.4d (Chapter 4), low wind speeds between 0.5 and 2.1 m/s occur most of the time.

In comparison, the monitored data from the UCG site (Figure 4.4a and Figure 4.4b – Chapter 4), also indicates winds predominating from the east and west but with wind speeds most commonly between 3.8 and 5.7 m/s. This will result in a higher dispersion potential when assessing the impacts due to the release of pollutants to the atmosphere, than would be case when assessing impacts using the SAWS modelled data.

- ***Precipitation***

The area under investigation lies in the summer rainfall region of South Africa, receiving a total annual rainfall of 1008 mm. The seasonality of the rainfall for the area is outlined further in Chapter 4 – Section 4.1.2. of this report.

- ***Temperature and Humidity***

Daily summer temperatures range between ~2 °C and ~32 °C with an average of ~17 °C. Winter temperatures range between ~ -8 °C and ~23 °C with an average of ~7 °C. The study area experiences high relative humidity during the summer months in excess of 70%.

[5] The Weather Services Unified Model was used for these purposes as hourly average data was required for use.

- ***Sensitive receptors***

Those receptors identified during the current study are listed as follows:

* Amersfoort and eZamokuhle Towns, approximately 5km north east of the proposed CCGT;
* Vlakplaats and Daggakraal communities, approximately 6km east of the proposed CCGT; and
* livestock farms and associated farm houses (on farms Palmietspruit; Strydkraal; Mezig; Holfontein; Welgedacht; Rietpoort; Rietfontein; Werda and Bergvliet) surrounding the proposed CCGT power plant.

- ***Other pollution sources in the area***

Based on a site visit and 1:50 000 topographical maps; the following sources of other air pollution have been identified. These are important to consider in terms of assessing the cumulative impact potential on air quality in the region:

* existing Majuba coal-fired power station
* Underground Coal Gasification Plant;
* agricultural activities (animal husbandry);
* vehicle entrainment and exhaust gas emissions;
* veld fires; and
* domestic fuel burning.

8.1.4 Potential Impacts on Air Quality

- ***Construction Phase***

The following possible sources of fugitive dust and particulate emissions were identified as activities which could potentially generate air pollution during construction operations (US-EPA, 1996):

- Demolition and debris removal
  * Demolition of obstacles such as boulders, trees, etc.
  * Loading of debris into trucks
  * Truck transport of debris
  * Truck unloading of debris
  * Vehicle emissions
  * Diesel fumes from diesel storage tanks

- Site preparation (earthworks)
  * Bulldozing
  * Scrapers unloading topsoil
  * Scrapers in travel
  * Scrapers removing topsoil
  * Loading of excavated material into trucks

- Truck dumping of fill material, road base, or other materials
- Compacting
- Motor grading
- Excavating
- Vehicle emissions

- General Construction
  - Vehicular traffic
  - Portable plants – aggregate processing
  - Concrete mixing

The following components of the environment may be impacted upon during the construction phase:

- ambient air quality;
- local residents and neighbouring communities;
- the aesthetic environment; and
- possibly fauna and flora.

- ***Operational Phase***

The operational component of the project being assessed will include the following infrastructure relevant to the air quality assessment being undertaken:

- CCGT power plant (comprising 6 units of approximately 350MW each);
- compressor plant;
- ignition gas for unit start-up (using commercial propane);
- gas pipeline from the UCG plant to the CCGT;
- water supply pipeline from the Rietpoort balancing dam;
- water treatment plant and associated infrastructure (i.e. ancillary works);
- sewage treatment plant; and
- general storage facilities.

The pollutants of concern during the current investigation are sulphur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide, particulate matter, diesel particulate matter, nuisance dust, volatile organic compounds and nuisance odours.

The releases of the greenhouse gas carbon dioxide will also be evaluated during the study.

- ***Decommissioning Phase***

The decommissioning phase is associated with activities related to the demolition of infrastructure and the rehabilitation of disturbed areas.

The following activities are associated with the decommissioning phase (US-EPA, 1996):

- existing buildings and structures demolished, rubble removed and the area levelled;
- remaining exposed excavated areas filled and levelled using overburden recovered from stockpiles;
- stockpiles smoothed and contoured;
- topsoil replaced using topsoil recovered from stockpiles; and
- land prepared for re-vegetation; and
- removal of chemicals like ammonia, coolant and liquid fuels.

Possible sources of fugitive dust emission during the closure and post-closure phase include:

- grading of sites;
- infrastructure demolition;
- infrastructure rubble piles;
- transport and dumping of building rubble;
- transport and dumping of topsoil; and
- preparation of soil for revegetation – ploughing and addition of fertiliser, compost etc.

Impacts for this phase will depend on the extent of rehabilitation efforts and are similar to those identified for the construction phase.

8.1.5 Conclusions and Recommendations

In terms of this Air Quality Scoping assessment, the following sources of current air pollution have been identified:

- stack, vent and fugitive emissions from the existing Majuba power station operations;
- Flaring at the UCG operations;
- agricultural activities on the surrounding farms;
- vehicle entrained dust and exhaust emissions;
- domestic fuel burning; and
- veld fires.

By sitting the proposed CCGT power plant adjacent to or within close proximity to the existing Majuba power station (and associated infrastructure), it is anticipated that the impacts will remain more localised, as opposed to if the proposed operations were to be located further away from the existing infrastructure, and the impacts were spread over a larger area. The exact impacts, however, can only be known once detailed dispersion modelling is undertaken, which will take into account the manner and rates at which emissions are released. Various operational scenarios and the meteorological data selected for use will also provide a better indication of the proposed impacts at the site.

In order to provide a better indication of the extent of the impacts expected from the proposed construction and operational phases of this development, dispersion simulations will need to

be undertaken. This will, however, only be able to take place once more detail is available regarding the nature of each source type and their respective emission rates.

An attempt will also be made to source ambient monitored data which will allow for a more accurate estimate of the potential for cumulative impacts on surrounding communities.

Once these impacts have been quantified, appropriate management measures can be suggested to best mitigate the predicted impacts. These modelled results will similarly allow for the assessment of compliance to current South African Ambient Air Quality Standards.

8.2 Noise

8.2.1 Introduction

Jongens Keet Associates was appointed by Bohlweki-SSI Environmental to undertake a noise impact study as part of the Scoping Study for the proposed CCGT power plant in the Amersfoort area, Mpumalanga Province. The noise impact assessment was undertaken in accordance with the requirements of the South African National Standard SANS 10328 (SABS 0328) *Methods for Environmental Noise Impact Assessments*.

8.2.2 Methodology

The general procedure used to determine the noise impact was guided by the requirements of the Code of Practice SANS 10328:2003: *Methods for Environmental Noise Impact Assessments.* A comprehensive assessment of all noise impact descriptors (standards) was undertaken. The noise impact criteria used specifically took into account those as specified in the South African National Standard SANS 10103:2003, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication* as well as those in the National Noise Control Regulations.

The investigation comprised the following:

i) Determination of the existing situation (prior to the planned development).
ii) Determination of the situation during construction and after commissioning.
iii) Assessment of the change in noise climate and impact.
iv) Comparison of alternative development sites.

- ***Determination of the Existing Conditions***

This phase comprised the following:

i) The relevant technical details of the planned CCGT Power Station, the existing traffic patterns and the existing and planned land use in the study area were reviewed in order to establish a comprehensive understanding of all aspects of the project that will influence the future noise climate in the respective study areas.

ii) Using these data, the limits of the study area for each alternative development site were determined and the potential noise sensitive areas, other major noise sources and potential problems in these areas were identified.

iii) Applicable noise standards were established. The National Noise Control Regulations and the SANS 10103:2004 standards were applied.

iv) The existing *noise climates* of the three study areas were determined by means of a field inspection and a noise measurement survey. The measurement survey appropriately covered the whole extent of the three study areas, focusing specifically on the identified noise sensitive/problem areas. The sound pressure level (SPL) (noise) measurements were taken in accordance with the requirements of the Code of Practice SANS 10103:2004, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication*. A Type 1 Integrating Sound Level meter was used for the noise measurements. All measurements were taken under dry weather and normal traffic (that is mid-week/school term) conditions.

v) On the general field inspection and at the same time as each individual measurement was being taken, the qualitative nature of the *noise climate* in the area of the measurement site was assessed and recorded. This comprised an appraisal of the general prevailing acoustic conditions based on the subjective response to the sounds as perceived by the listener (i.e. *auditory observation* by the surveyor), as well as identifying those noise incidents, which influenced the noise meter readings during that measurement period. This procedure is essential in order to ensure that that there is a *human* correlation between the noise as perceived by the human ear and that, which is measured by the meter, as well as to establish any anomalies in the general ambient noise conditions.

vi) The existing noise climates along the main roads as related to the current traffic volumes and patterns were established. These traffic noise levels were calculated using the South African National Standard SANS 10210 (SABS 0210) *Calculating and Predicting Road Traffic Noise*. The latest traffic was used as the baseline reference. The calculated 24-hour period noise indicators, as well as those for the daytime period and night-time period provided the main data for the impact assessment. The measured data provided a field check of the acoustic conditions.

- ***Assessment of Planning/Design Phase and Construction Phase Impacts***

Aspects of the pre-design field surveys and construction activities that potentially will have a noise impact were identified.

- ***Assessment of Operational Phase Impacts***

The main focus of the operational phase assessment was to establish the nature, magnitude and extent of the potential change in *noise climate* in the study area directly related to and within the area of influence of each of the three alternative development sites. This was done as follows:

i) The likely noise that will be generated by the CCGT Power Station operations was established and this was used to determine the potential footprint of impact.

ii) In order to determine the most appropriate farm on which to construct the CCGT Power Station, the three alternative sites were compared by rating nine noise impact aspects related to the development infrastructure and site characteristics.

iii) Based on the findings, appropriate noise mitigating measures (site scale) have been investigated and recommendations made. These are conceptual and not detailed to final design level.

8.2.3 Potential Noise Impacts

- ***The Residual (Existing) Noise Climate***

The determination of the residual (existing) noise climate in the two respective potential development areas (three sites) is based on the measurements and observations made in the area, and where relevant also from the calculation of the noise from the traffic on the main roads.

In overview, the existing situation with respect to the existing *noise climate* in the study area was found to be as follows:

i) The main sources of noise in the area are from:
   a) Traffic on National Road N11, Road P48/1, Road P97/1, Road D2514 and Road D284.
   b) The existing Majuba Power Station. The noise from the power station operations has a significant influence for up to about 4000 metres from the facility.

ii) The existing *noise climate* alongside the main roads is degraded with regard to suburban residential living. In some areas residences are negatively impacted from traffic noise (particularly at night) for up to the following distances from these roads:
   a) National Road N11 - 350m
   b) Road P48/1 - 180m
   c) Road P97/1 (N) - 400m
   d) Road P97/1 (S) - 180m
   e) Road D2514 (W) - 200m
   f) Road D2514 (E) - Road reserve boundary (no impact)
   g) Road D284 - Road reserve boundary (no impact)

iii) The residual (existing background) noise levels are relatively low (quiet) in the sections of the study area that are not close to and that are relatively shielded by the terrain from the main roads. Daytime ambient conditions range from about 37dBA to 45dBA. The late evening and night-time conditions fall to between 30dBA and 35dBA. These are typical of the ambient noise conditions in a rural (farming) area (SANS 10103).

iv) The area at the school (measurement Site 2) on the farm Rietfontein (just west of Road D284 and about 700 metres north of Road D2514) is quiet with ambient noise levels within the limits appropriate for educational facilities.

- ***The Predicted Noise Climate (Pre-construction Phase)***

Activities during the planning and design phase that normally have possible noise impact implications are those related to field surveys (such seismic testing and geological test borehole drilling for large building foundations). As these activities are usually of short duration and take place during the day, they are unlikely to cause any noise disturbance or nuisance in adjacent areas.

- ***The Predicted Noise Climate (Construction Phase)***

Construction will likely be carried out during the daytime only (06h00 to 18h00 or 20h00). It should however be noted that certain activities may occasionally extend into the late evening (till 20h00) period, while others such as de-watering operations may need to take place over a 24-hour period. Some of the activities such as the construction of the chimney stacks could take place continuously (24-hours a day) over a number of weeks if a continuous sliding shutter concreting operation is used. It is estimated that the development of the project will take place over a period of 3 to 4 years.
A large construction camp will need to be established.

The nature of the noise impact from the construction sites is likely to be as follows:

i) Source noise levels from many of the construction activities will be high. Noise levels from all work areas will vary constantly and in many instances significantly over short periods during any day working period.
ii) Ideally the daytime outdoor ambient noise levels should not exceed 45dBA for rural residential areas or 55dBA for urban residential areas (as specified in SANS 10103). The night-time outdoor ambient noise levels should not exceed 35dBA for rural residential areas or 45dBA for urban residential areas.
iii) Exact daytime period and night-time period continuous equivalent sound pressure levels are not possible to calculate with certainty at this stage as the final construction site layout, work programme, work *modus operandi* and type of equipment have not been finalised. Working on a worst case scenario basis, it is estimated that short term maximum noise levels from general construction operations should not exceed 62dBA at a distance of 1500 metres from the boundary of the activity site.
iv) For general construction, the ambient noise levels generated should not exceed 56dBA at 250 metres offset.
v) There are likely to be noise disturbance and noise nuisance effects on people living in close proximity to the construction sites.
vi) It should be noted that for residential areas, higher ambient noise levels than recommended in SANS 10103 are normally accepted as being reasonable during the construction period, provided that the very noisy construction activities are limited to the daytime and during the week, and that the contractor takes reasonable measures to limit noise at the work site. Note that it has been assumed that surface facility construction will generally take place from 07h00 to 18h00 or 20h00 with no activities (or at least no noisy construction activities) at night and so there should not be a problem.

vii) No assessment of the construction traffic has been made at this stage. The noise impact from this source is not expected to be severe but this aspect will need to be investigated in more detail at the EIA Phase once the site of the new power station is finalised.

viii) For all construction work, the construction workers working with or in close proximity to equipment will be exposed to high levels of noise.

- ***The Predicted Noise Climate (Operational Phase)***

  * ***CCGT Power Plant***

The main noise sources at the CCGT power plant will be from the cooling fans, the compressors and the gas turbines. As the generating units and associated plant are likely to be enclosed in a building, the noise from the cooling fans will be the loudest contributing source that will predominate at areas outside the CCGT power plant property. It is predicted that the noise levels from the CCGT power plant could be of the following order at the given offsets from the cooling fan installation:

Offset from the Plant		**Noise Level (dBA)**
1000m	-	55
2000m	-	49
3000m	-	44
4000m	-	39
5000m	-	35

The noise levels given are the unmitigated values. A conservative approach has been taken in that a hard intervening ground condition has been modelled. There will be greater attenuation than shown with distance where there are houses, other buildings and terrain restraints in the intervening ground between the source and the receiver point. The sparse vegetation in the area will not assist the attenuation with distance.

Using a night-time maximum noise limit standard of 40dBA, noise sensitive sites within 4000 metres of the new CCGT power plant could potentially be impacted. This has been used as the distance for assessment around each of the potential development sites.

  * ***CCGT Power Plant Generated Traffic***

The Traffic Impact Team has not yet made an assessment of the operational traffic which will be generated by the CCGT Power Station once it has been commissioned. It is estimated at this stage that the total daily traffic that will be generated by the new facility will be relatively small in comparison to the total volume of traffic on the adjacent main roads affecting all of the three potential development sites.

8.2.4 Conclusions

The following may be concluded from the foregoing analysis:

i) Although not all of the final baseline noise design data was available for the analysis, the assumptions made are considered adequate to give a meaningful analysis of the noise impact situation at Scoping level.

ii) The area of potentially serious noise impact around the planned CCGT power plant will be relatively small (contained within a radius of about 4 kilometres). There are noise sensitive receptors within this area of influence at all three analysis sites. Provided that the optimum location on the respective development area is selected, noise impact can be reduced.

iii) None of the sites are “no go” areas.

iv) There are practical mitigating measures that can be implemented to prevent or reduce impact.

8.2.5 Recommendations

The following are recommended:

i) The National Noise Control Regulations and SANS 10103 should be used as the main guidelines for addressing the potential noise impact on this project.

ii) Once the preferred development site is selected, further more detailed analysis of the noise impact situation will need to be undertaken. For this future work, the final footprint of the CCGT Power Station on the selected development site, the technical details of the Power Station plant (layout and baseline noise profiles of all equipment), the operating conditions (including traffic) must be known.

8.3 Social Impact Assessment

8.3.1 Introduction

This section details the results of the Scoping Phase of the Social Impact Assessment (SIA) conducted by MasterQ Research as part of the EIA process. The overall objective of the Revised Scoping Phase is to identify potential impacts and possible fatal flaws, and to provide a framework (or terms of reference) within which a detailed assessment is to be undertaken during the Impact Assessment phase to follow.

8.3.2 Methodology

In order to do this, the affected local areas have been scoped in terms of the following change processes:

- **Demographic Processes**: the number and composition of the local population;

- **Economic Processes**: the way in which people make a living and the economic activities within a specific (affected) area;
- **Empowerment and Institutional Processes**: people's ability to become actively involved and influence the decision making process, and also the efficiency and operation of local authorities and other significant organisations);
- **Socio-Cultural Processes**: the way in which humans interact and relate to each other within the context of their environment, and how this interaction is guided by value systems;
- **Geographic Processes**: the land use pattern within the (affected) area; and
- **Biophysical Processes**: the way in which the physical environment influences a person's experience of their social environment.
- ***Data Collection***

To obtain baseline information on the social conditions characterising the study area on individual, community, institutional and organisational level in terms of current and predicted future changes with and without the project, data collection methods took on the following forms:

- Site visits on 14 November 2007 and 30 April 2008;
- A desktop study of the sites and surrounding areas through the use of *Google Earth*;
- Perusing the various locality maps generated through the project process; and
- Existing project documentation, e.g. the Screening Study and the initial draft SIA Scoping Report (January 2008, revised February 2008).

Information that was relevant to the project was identified and assessed from these sources, and within the context of the pre-construction, construction, operational, and decommissioning phases of the proposed project.

8.3.3 Potential Impacts on the Social Environment

For the purposes of the revised scoping study, the impact variables were categorised in terms of change processes, as previously mentioned. A change process can be defined as change that takes place within the receiving environment as a result of a direct or indirect intervention. A potential impact follows as a result of the change process. However, a change process can only result in an impact once it is experienced as such by an individual/community on a physical and/or cognitive level.

The following subsections discuss the various change processes and the potential impacts that could be experienced by the receiving environment as a result of the proposed project.

8.3.3.1 Demographic Processes (without the project)

Demographic processes relate to the number of people and composition of a community and include an overview of the population size and the educational profile of the affected communities.

8.3.3.2 Demographic Change Processes (as a result of the project)

The construction and maintenance of the proposed CCGT plant and associated infrastructure could lead to a change in the number and composition of the population within the affected local areas, which in turn could lead to economic, land use, and socio-cultural change processes.

8.3.3.3 Potential Impacts – Demographic Processes

Table 8.1 below provides an overview of the expected demographic change process to occur as well as the expected impacts that might occur as a result of the change process taking place. These potential impacts will be assessed in detail during the Impact Assessment phase.

Table 8.1 Overview of Expected Demographic Change Processes and Potential Impacts

DEMOGRAPHIC CHANGE PROCESSES				
Expected Change Process	**Potential Impact**	**Sites Potentially affected**	**Project Phase**	**Status**
Relocation of households and/or population segments	Relocation of households would have an impact on people's way of life and the standard of life that these people have grown accustomed to.	Sites 2A and 2B	Pre-construction, construction and operation	Negative
Influx of construction workers	Influx of construction workers that will lead to a change in the number and composition of the local community, and impact on economy, health, safety and social well-being.	All	Pre-construction and construction	Negative to neutral
Influx of job seekers	Influx of job seekers that will lead to a change in the number and composition of the local community, and	All	Pre-construction and	Negative

DEMOGRAPHIC CHANGE PROCESSES				
Expected Change Process	**Potential Impact**	**Sites Potentially affected**	**Project Phase**	**Status**
	impact on economy, health, safety and social well-being.		construction	
Influx of maintenance workers	Influx of maintenance workers that will lead to a change in the number and composition of the local community, and impact on economy, health, safety and social well-being.	All	Operation	Negative to neutral

8.3.3.4 Economic Processes (without the project)

Economic processes relate to the way in which people make a living and the economic activities within that society. The employment status within any given area gives an indication of the economic stability of such an area and also serves as an indicator of such an area's general well-being. This section includes assets that the families/households have, which will be assessed in this study.

8.3.3.5 Economic Change Processes (as a result of the project)

Economic change processes relate to the changes brought about to the employment and general economic profile of an area as a result of the introduction of any development. For example, job opportunities might be created as a result of the construction and maintenance of the proposed CCGT plant and associated infrastructure. Employment creates a source of income, which in turn enables the employed individual to access services and a support mechanism for his/her family.

8.3.3.6 Potential Impacts – Economic Processes

Table 8.2 below provides an overview of the expected economic change process to occur as well as the expected impacts that might occur as a result of the change process taking place. These potential impacts will be assessed in detail during the Impact Assessment phase.

Table 8.2 Overview of Expected Economic Change Processes and Potential Impacts

ECONOMIC CHANGE PROCESSES				
Expected Change Process	**Potential Impact**	**Sites Potentially affected**	**Project Phase**	**Status**
Land acquisition (financial compensation)	Compensation for land that might lead to an economic impact on the short to medium term.	Depends on ownership	Pre-construction and construction	Dependant on outcome of negotiation process
Direct formal employment opportunities to local individuals	Direct formal job opportunities for local individuals and/or contractors that creates income (economic impact).	All	Pre-construction, construction and operation	Positive
Indirect formal and/or informal employment opportunities to local individuals	Indirect formal and/or informal job opportunities for local individuals and/or contractors that creates income (economic impact).	All	Pre-construction and construction	Positive

8.3.3.7 Empowerment and Institutional Processes (without the project)

Empowerment and Institutional processes relate to the role, efficiency and operation of government sectors and other organisations within the area in terms of service delivery. It also investigates the ability of people to engage in decision-making processes to such an extent that they have an impact on the way in which decisions are made that would concern them.

8.3.3.8 Empowerment and Institutional Processes (as a result of the project)

Negotiation for land is a change process on an empowerment and institutional level. The same applies to the stakeholders that will be involved in the public participation process. The EIA process is an opportunity for these stakeholders to give input into the process and project. However, stakeholders would have to offer up their time to become actively involved in the process and they should clearly understand their rights in terms of the process to enable them to use these rights.

8.3.3.9 Potential Impact - Empowerment and Institutional Processes

Table 8.3 below provides an overview of the expected change processes to occur as well as the expected impacts that might occur as a result of these change processes taking place. These potential impacts will be assessed in detail during the Impact Assessment phase.

Table 8.3 Overview of Expected Empowerment and Institutional Change Processes and Potential Impacts

EMPOWERMENT AND INSTITUTIONAL CHANGE PROCESSES				
Expected Change Process	**Potential Impact**	**Sites Potentially affected**	**Project Phase**	**Status**
Attitude formation against the proposed project	Attitude formation against the project could have economic impacts and could impact on social well-being.	All	Pre-construction and construction	Negative
Negotiation process	A breakdown in the negotiation process in terms of land acquisition could severely delay the project and result in an economic impact on both the landowner as well as on Eskom.	All (but depends on ownership)	Pre-construction	Negative to neutral

8.3.3.10 Socio-Cultural Processes (without the project)

Socio-cultural processes relate to the way in which humans behave, interact and relate to each other and their environment, as well as the belief and value systems which guide these interactions.

At the time of the study, not enough information was available to determine the level of cultural attachment that residents have to the area. Sense of place goes hand in hand with place attachment, which is the sense of connectedness a person/community feels towards certain places. Place attachment may be evident at different geographic levels, i.e. site specific (e.g. a house, burial site, or tree where religious gatherings take place), area specific (e.g. a residential area), and/or physiographic specific (e.g. an attachment to the look and feel of an area). The concept of sense of place attempts to integrate the character of a setting with the personal emotions, memories and cultural activities associated with such a setting.

8.3.3.11 Socio-Cultural Change Processes (as a result of the project)

Socio-cultural change processes that are associated with the construction and operation of the proposed project include changes such as health and safety aspects and sense of place. The concept of 'health' is not only limited to physical health (i.e. the absence of ailments or illness), but also includes mental and social health. The expected changes that can occur in relation to health and safety aspects can be as a result of the presence of the proposed CCGT plant and associated infrastructure (such as elevated, above ground pipelines) during operation, as well as the presence of construction workers and/or job seekers during construction.

8.3.3.12 Potential Impacts - Socio-Cultural Change Processes

Table 8.4 below provides an overview of the expected change processes as well as the expected impacts that might occur as a result of the change processes taking place. These potential impacts will be assessed in detail during the Impact Assessment phase.

Table 8.4 Overview of Expected Socio-Cultural Change Processes and Potential Impacts

SOCIO-CULTURAL CHANGE PROCESSES				
Expected Change Process	**Potential Impact**	**Sites Potentially affected**	**Project Phase**	**Status**
Integration of construction workers into local areas	Socially acceptable integration, including the risk of spreading STIs and HIV/AIDS with an impact on health.	All	Pre-construction and construction	Negative
Traffic movement	An increase in traffic could lead to a disruption of local movement patterns. An increase in (construction) traffic might damage the road network adding to the impact of frustration and a disruption in the normal traffic movement patterns.	All, depending on the access roads that will be used	Pre-construction and construction	Negative
Safety and security	Presence of construction workers and job seekers on surrounding landowners' sense of safety and security.	Sites 2A and 2B (isolated households, if not relocated)	Pre-construction and construction	Negative

SOCIO-CULTURAL CHANGE PROCESSES				
Expected Change Process	**Potential Impact**	**Sites Potentially affected**	**Project Phase**	**Status**
Noise pollution	Psycho-social impact of construction and operational activities and resultant noise pollution on surrounding landowners.	Sites 2A and 2B (isolated households, if not relocated)	Construction and operation	Negative
Sense of place	The location of the proposed CCGT plant and associated infrastructure (e.g. pipelines) might impact on sense of place of inhabitants.	Site 4 (more of a 'greenfields' site)	Operation	Negative to neutral
Third party tampering (on pipelines)	Tampering on the pipelines that will not only compromise the safety of the pipelines but also on both the local area's residents as well as the offender's, thereby impacting on people's health and safety.	All, depends on the layout of the pipelines	Operation	Negative

8.3.3.13 Geographical Processes (without the project)

Geographical processes relate to land use patterns and infrastructure in the area. This section therefore describes the land use in the study area from a social perspective.
A general assessment of the land uses in the area indicated the following trends:

- Residential;
- Commercial cattle and crop farming;
- Mining; and
- Energy generation.

8.3.3.14 Geographical Change Processes (as a result of the project)

Geographical change processes refer to land use change as a result of the actual or perceived changes in land use, whether it be on a temporary or permanent basis. The construction and maintenance of the proposed CCGT plant and associated infrastructure might lead to a change in the land use within the local area. The assessment of a land use change process from a social perspective takes into account how the proposed CCGT plant

as associated infrastructure, such as pipelines, might affect the behaviour/lives of land owners and/or land users.

8.3.3.15 Potential Impacts - Geographical Change Processes

Table 8.5 below provides an overview of the expected change process as well as the expected impacts that might occur as a result of the change process taking place. These potential impacts will be assessed in detail during the Impact Assessment phase.

Table 8.5 Overview of Expected Geographical Change Processes and Potential Impacts

GEOGRAPHICAL CHANGE PROCESSES				
Expected Change Process	**Potential Impact**	**Sites Potentially affected**	**Project Phase**	**Status**
Cultivated and grazing land	Temporary loss of cultivated and grazing land due to construction activities, leads to a decreased area for cultivation and grazing, resulting in an economic impact. Also permanent loss of cultivated and grazing land through the land acquisition process.	Site 4	Construction and Operation	Negative
Maintenance of access roads	Non-maintenance on access roads leads to roads becoming impassable, impacting on the road safety and the safety of road users.	All	Construction and operation	Negative
Tourism potential	The visibility of the CCGT plant and pipelines could lead to an indirect economic change if clientele is lost when their expectations of the area is not met.	All	Operation	Negative

8.3.3.16 Biophysical Processes (without the project)

The biophysical environment can lead to indirect social impacts, as illustrated in Figure 8. For example, relocation of people can have an impact on income levels, which can lead to processes of rural to urban migration, which can result in further impacts on income levels and changes in food production.

8.3.3.17 Biophysical Change Processes (as a result of the project)

Social change processes can lead to biophysical change processes. Economic developments to increase tourism numbers can change land use and water quality, which can have indirect human impacts because of the reduction in agricultural production, and subsequent lower income levels (Slootweg et al. 2001).

8.3.3.18 Potential Impacts - Biophysical Change Processes

Table 8.6 below provides an overview of the expected change process as well as the expected impacts that might occur as a result of the change process taking place. These potential impacts will be assessed in detail during the Impact Assessment phase.

Table 8.6 Overview of Expected Biophysical Change Processes and Potential Impacts

BIOPHYSICAL CHANGE PROCESSES				
Expected Change Process	**Potential Impact**	**Sites Potentially affected**	**Project Phase**	**Status**
Pollution and fire risk	The impact of pollution and fire risk on construction workers and the surrounding community's health and safety.	All	Pre-construction and construction	Negative
Sanitation	Lack of sanitation, impacts on the environment, which could affect health of people.	All	Pre-construction and construction	Negative
Mining/prospecting operations	Presence and operation of proposed CCGT plant could impact on safety of mining operations and vice versa.	Site 2A and to some extent Site 2B	Construction and Operation	Negative
The presence of the CCGT plant and pipelines	The impact that the presence of the CCGT plant and pipelines have on the physical and mental wellbeing of the local community.	All	Operation	Negative

8.3.4 Conclusions and Recommendations

This report fulfilled the objectives of the Revised Scoping Phase, which was to identify any potential impacts or possible fatal flaws from a social perspective to enable a more focused study in the Impact Assessment Phase.

During the scoping study, no issues emerged that can be considered as fatal flaws from a social perspective. However, there are areas of concern (notably the potential impact on areas such as Daggakraal and Vlakplaats) and therefore careful consideration should be given to the enhancement and/or mitigation measures (that will be proposed during the next phase of the project), both during the construction as well as the operation phases of the project.

The proposed terms of reference for the detailed SIA are provided in Table 8.7 below.

Table 8.7 Terms of Reference for studies to be carried out in the EIA Phase

CHANGE PROCESS	RECOMMENDED STUDIES
Demographic	• Conduct a desktop study to try and determine what the expected population growth rate is and how this would be influenced by the HIV infection rate in order to establish how the population would have expanded without the influx of construction workers and/or job seekers; • Obtain and analyse information from the project proponent on the construction process, the associated timeframes as well as the size and composition of the construction team for both the construction of the CCGT plant itself as well as the associated infrastructure such as pipelines; • Obtain and analyse information from the public participation consultants on the local residents' expectations in terms of the proposed project within the social realm, in order to better understand local residents' viewpoint on the proposed project and the potential risk for conflict and other forms of active and passive social mobilisation; and • Obtain and analyse information from the project proponent on the maintenance process of both the CCGT plant as well as associated infrastructure (e.g. pipelines), as well as the size, composition and origin of the maintenance team (e.g. determine whether the maintenance team forms part of the permanent workforce at the plant).
Economic	• Obtain information from the public participation consultants on registered landowners in the area to determine which sites are located on privately owned land and would therefore need to be compensated in order to assess the extent of the economic impact as a result of compensation;

CHANGE PROCESS	RECOMMENDED STUDIES
	• Obtain information from the public participation consultants on possible land claims in the area to determine whether any sites are or have the potential to be owned by tribal authorities; • Obtain and analyse information from the project proponent on the negotiation process and how compensation is calculated; and • Obtain and analyse information from the project proponent on an average salary package for an unskilled labourer to determine the extent and timeframe of economic impacts on local residents as a result of employment. • Establish the assets that these communities hold, e.g. livestock, etc.
Empowerment and Institutional	• Obtain the issues register or issues report from the public participation consultants to determine the recurrent issues raised from the public's side and how these issues were addressed throughout the process. An analysis of these issues would indicate the risk for social mobilisation.
Socio-cultural	• Focus group meetings with community leaders and/or an observational study to determine the cultural dynamics and movement patterns of local residents; • Obtain and analyse information, if any, from the project proponent on the mechanisms implemented at a construction site to enhance the safety of both the construction worker as well as that of local residents passing through the area; • Obtain and analyse the results of the noise specialist study to determine the increase in noise levels and the resultant potential psycho-social impact on surrounding residential areas and/or scattered households; • Obtain information from the public participation consultants on the surrounding landowners. Either attend or organise a focus group meeting with these landowners to determine their attachment to the area; • Obtain and analyse information from the project proponent on the activities of maintenance workers and where these workers are sourced from; and • Obtain and analyse information from the project proponent on the proposed layout of the pipelines, also in terms of the construction process of such pipelines.
Geographical	• Obtain and analyse information from the relevant specialist on the agricultural potential of the sites; • Obtain and analyse information from the project proponent on the size and number of the construction and operational vehicles. Also obtain information from the relevant specialist

CHANGE PROCESS	RECOMMENDED STUDIES
	conducting the traffic impact assessment, if any. • Scrutinise the IDP and SDF of the affected district and local municipality in terms of future developments and tourism. If additional information is required other than that contained in the IDP/SDF, conduct interview(s) with relevant town planners and tourism bodies.
Biophysical	• Obtain and analyse information from project proponent and/or construction contractor(s) on mechanisms implemented at construction sites and/or construction villages in terms of health, safety, sanitation services, etc. • Obtain information from mining companies on the safety mechanisms in place at the mining operation and how they foresee that the presence and operation of the proposed CCGT plant and pipelines might affect their operations – this information might become available via the public participation process. If not, interview(s) will be conducted with mining house representatives; and • Obtain and analyse information from project proponent on safety aspects and health studies conducted as similar installations. Also conduct a broad based desktop study on the potential health implications of such an installation, whether it is real or perceived.

Deliverables: a complete report showing the socio-economic status of the communities, etc.

8.4 Visual

8.4.1 Introduction

The visual impact assessment (VIA) for the proposed combined cycle gas turbine (CCGT) power plant in the Amersfoort area in Mpumalanga Province has been undertaken by Dawie van Vuuren from MetroGIS (Pty) Ltd. in his capacity as visual assessment and Geographic Information Systems specialist.

The main issue with regard to visual impact is the introduction of a new facility on a “greenfields” site in a rural landscape. The landscape is characterised by flat to undulating plains, with views that are wide and open. The presence of koppies and ridges in the background is a strong visual component in the landscape (Photograph 8.1). It is expected that these views will be blocked or disturbed by the CCGT with its bold and tall structures, especially with regard to Site 4.

Photograph 8.1 Panoramic views of the rural landscape in the Majuba area

8.4.2 Methodology

This project has been undertaken as a desktop study involving the following:

- Data Processing - processing of data in the existing GIS project;
- Data Analysis- viewshed analysis of all three sites;
- Map Production- create maps of Scoping sites and create maps of viewshed analysis;
- Photographs - create panoramic views of existing photographs; and
- Interpretation - interpretation of GIS data, maps and photographs.

8.4.3 Potential Visual Impacts

Due to the large footprint and vertical dimensions of the proposed CCGT power plant, and the predominantly flat topography of the region, it becomes apparent that the facility would be well exposed. The issues relating to visual impact are the following:

- Visibility
- Proximity
- Exposure

- ***Visibility***

A viewshed analysis of the CCGT plant, based on a 20m contour interval digital terrain model of the study area, indicates the visibility of a random point within each site. The offset for each point was taken at 60m above ground level.

The results as displayed on the maps in Figures 8.1 – 8.3 must be regarded as preliminary. A more detailed viewshed analysis for the full extent of site development will be undertaken during the EIA phase. It is expected, however, that those results will bear a similar pattern in terms of the degree of visibility for each site.

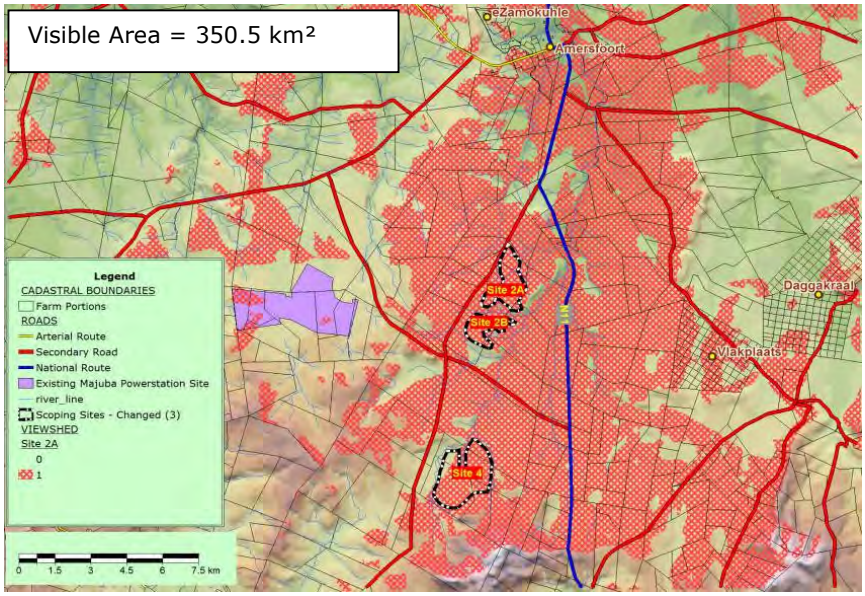

Figure 8.1 Potential visibility of Site 2A

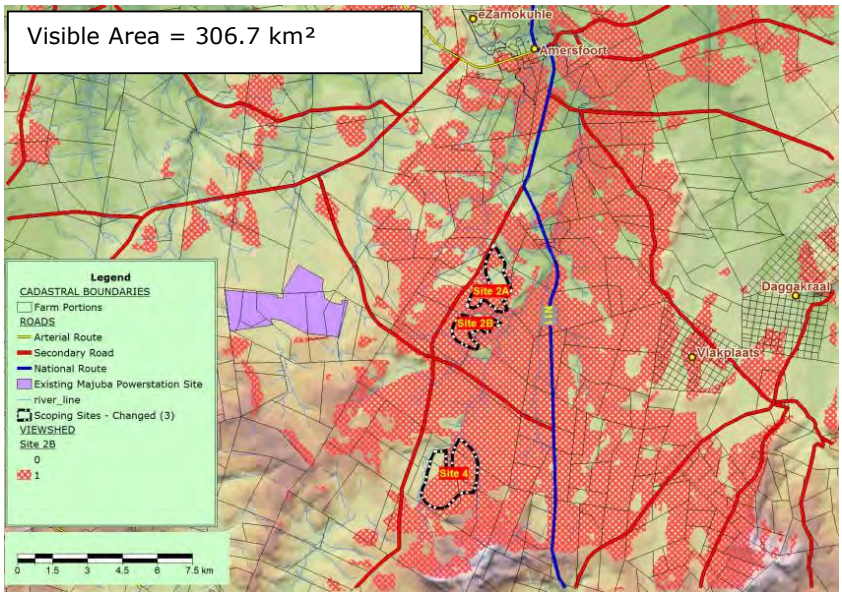

Figure 8.2 Potential visibility of Site 2B

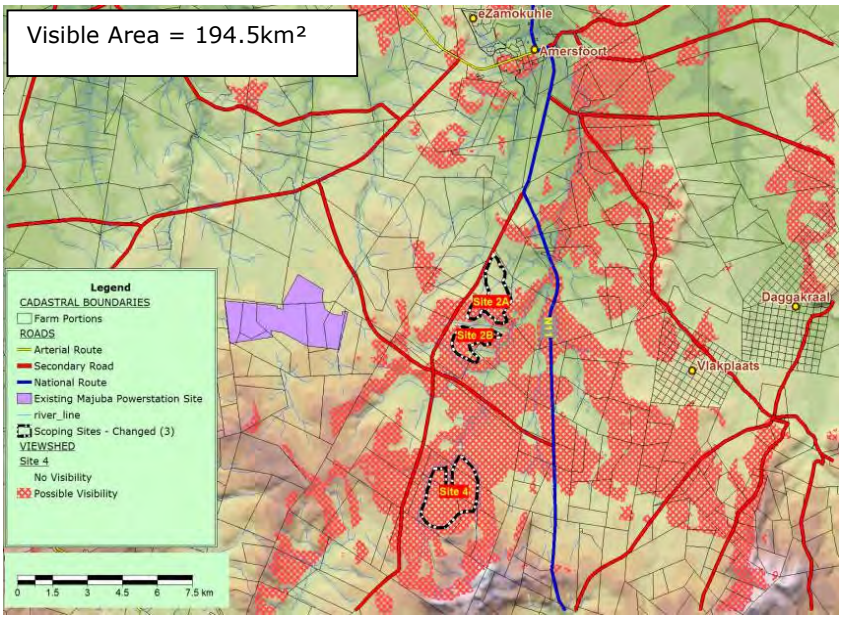

Figure 8.3 Potential visibility of Site 4

It is evident from the figures above that Site 2A offers the highest degree of possible visibility. The visibility of Site 4 is **45% less** than Site 2A. This is due to the nature of the topography, with Site 4 being closer to high ground that shields it from being visible over large parts of the study area.

From a visibility point of view Site 4 could be regarded as a favourable site for selection. However, the aspect of exposure and the degree of landscape transformation must also be considered.

- **Proximity**

Proximity to areas of high viewer incidence is an issue that needs to be considered. Potential sensitive viewers are normally concentrated on roads and areas of residence and workplace. The N11 national road and the places of Amersfoort, eZamokhule, Daggakraal and Vlakplaats represent areas of high viewer incidence. Of all the alternatives, Sites 2A and 2B is located the closest to these areas and it is expected that visual impacts for this location will be greater than for Site 4. In addition sensitive viewers might also be present at farmsteads and on other roads in the area. These will be analysed in more detail in the EIA report.

- ***Exposure***

As mentioned above, the mere extent of the proposed CCGT power plant will render a high degree of exposure to viewers from all directions. The location of the facility in relation to the existing Majuba power station will therefore play an important role in the level of visual impacts. It is generally accepted that a location closer to areas that have already been developed, will allow for greater visual absorption by virtue of the following aspects:

- The visual impact of power generation facilities is focussed in a smaller area;
- The existing buildings and high-rise structures on Site 2A may render a degree of visual absorption capacity.

The effect of exposure from an isolated location is illustrated in Figure 8.4.

Photograph 8.2 **V**isual exposure above ground cover of the existing CCGT plant at Atlantis.

8.4.4 Conclusions

The proposed CCGT plant is an extensive facility with large horizontal and vertical dimensions. The environment is open grassland with agriculture being the main economic activity in the area. Possible sensitive receptors are present on farmsteads in close vicinity and on agricultural holdings to the east of the alternative sites. These viewers are mostly familiarized with the rural character of the area.
Whereas the existing Majuba power station has already been established as a visual entity, the introduction of the CCGT as a new facility in the area must be planned with care. Therefore a location close the power station is ideal to reduce the visual impacts that will be difficult to mitigate otherwise.

No conclusive results were obtained from this study to make any recommendations on a preferred site from a visual impact point of view. More site specific information is required which will be obtained from a next site visit.

8.4.5 Recommendations

An initial scanning level assessment of the above issues did not reveal any fatal flaws to be associated with the proposed CCGT plant.

These issues should however still be investigated in greater detail in order to scientifically motivate and/or identify any other mitigating/aggravating circumstances. The potential cumulative visual impact of the existing power station and the proposed project should also be addressed as a site-specific issue. Whereas the positioning of the CCGT facility within the alternative sites has not been determined yet, it is assumed that the closest possible location to the existing Majuba Power Station will be favourable from a visual point of view.

As part of the EIA document the following visual components will be integrated into a single visual impact matrix and spatially represented to arrive at more conclusive results:

- Visual distance/observer proximity to the facility (apply the principle of reduced impact over distance in a buffer analysis)
- Viewer incidence/viewer perception (identify areas with high viewer incidence and negative viewer perception)
- Landscape character/land use character (identify conflict areas in terms of existing and proposed land use)
- Visually sensitive features (scenic features or attractions)
- General visual quality of the affected area
- Visual absorption capacity of the natural vegetation
- The effect of existing man-made structures on the visual exposure
- Potential visual impact of lighting (after hours operations and security)
- Potential mitigation measures.

8.5 Heritage

8.5.1 Introduction

Dr Johnny van Schalkwyk was appointed by Bohlweki-SSI Environmental to conduct a heritage survey to locate, identify, evaluate and document sites, objects and structures of cultural importance found within the boundaries of areas in which it is proposed to develop a Combined Cycle Gas Turbine Power Plant. The aim of the survey was to determine the nature and potential of cultural heritage resources found within the boundaries of the area that is to be impacted by the proposed project Based on this, a selection is to be made on the most viable area in which the development can take place. This will largely be determined by:

- The significance of identified heritage sites (e.g. Grade I sites are of national significance and should be avoided).
- The area where the least number of heritage sites will be impacted on.

8.5.2 Methodology

- ***Preliminary investigation***

- Survey of the literature - a survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area. In this regard, various anthropological, archaeological and historical sources were consulted.
- Databases - the Heritage Sites Database and the Environmental Potential Atlas were consulted.
- Other sources - historical photographs, topocadastral and other maps were also studied.

- ***Field survey***

The field survey was done according to generally accepted archaeological practices, and was aimed at locating all possible sites, objects and structures. The area was investigated by driving to accessible spots to investigate the areas where the development site would be located. Special attention was given to topographical occurrences such as trenches, holes, outcrops and clusters of trees.

- ***Documentation***

All sites, objects and structures that were identified were documented according to the general minimum standards accepted by the archaeological profession.

8.5.3 Potential Impacts on Heritage

A Heritage Impact Assessment is focused on two phases of a proposed development: **the construction** and **operation phases**. However, from a cultural heritage perspective, this distinction does not apply. Heritage sites are fixed features in the environment, occurring within specific spatial confines. Any impact upon them is permanent and non-reversible. Those resources that cannot be avoided and that are directly impacted by the proposed can be excavated/recorded and a management plan can be developed for future action. Those sites that are not impacted, can be written into the management plan, whence they can be avoided or cared for in the future.

One site of cultural significance was identified to exist on the farm Welgedacht 82HS (Site 4). As few other sites are known from this region, this site would have a high significance on a regional level. In terms of Section 7 of the NHR Act, No. 25 of 1999, this site would have Grade II significance.

In addition, the following project actions may impact negatively on archaeological sites and other features of cultural importance (refer to Table 8.9 below). The actions are most likely to occur during the construction phase of a project.

Table 8.8 Potential impact on heritage during the construction and operation phase

Potential Impact	Source of Impact
Construction Phase	
Actually identified risks Damage to sites	 Construction work
Anticipated risks Looting of sites	 Curious workers
Operation Phase	
Actually identified risks Damage to sites	 Not adhering to management plans
Anticipated risks Damage to sites Looting of sites	 Unscheduled construction/developments Visitors removing objects as keepsakes

8.5.4 Conclusions and Recommendations

A survey was conducted to locate, identify, evaluate and document sites, objects and structures of cultural importance found within the boundaries of areas in which it is proposed to develop a Combined Cycle Gas Turbine Power Plant.

One site of cultural significance was identified to exist on the farm Welgedacht 82HS (Site 4). As few other sites are known from this region, this site would have a high significance on a regional level. In terms of Section 7 of the NHR Act, No. 25 of 1999, this site would have Grade II significance. Because of its estimated position on the southern edge of the study area, it would seem, provisionally, that a direct impact could be avoided on the site. Alternatively, suitable mitigation measures must be applied before development can take place in the area. These measures would include the documentation and archaeological excavation of the site(s) in question.

In line with this finding, it is recommended that a full Phase 1 archaeological survey of the selected areas is done in accordance with the requirements of Section 38(3) of the National Heritage Resources Act (Act 25 of 1999) before development takes place.

8.6 Risk

A risk assessment on human health for the CCGT power plant would concentrate on fires, explosions and toxic clouds from an accidental release of the producer gas. The further people are located from the point of release, the less they would experience the impact of an accidental release. As all the prospective sites are located in rural areas with some distance

to larger populations, differences in risk between the sites would not be sufficient to give a site preference. The location of the CCGT power plant on an individual site could have more significance than the ultimate selection of the site.

8.6.1 Recommendations

Suggested risk assessment terms of reference for the EIA phase of the project would include:

i. Determination of the impacts from fire, explosions and toxic vapour clouds for major incidents;
ii. Give the probability of major events;
iii. Give an indication if the installation would be considered a Major Hazardous Installation in accordance with legislation;
iv. Give an indication if there are any fatal flaws with regards to the project site, engineering, process or substances; and
v. Give suggested mitigation to reduce the impacts of the project, if required.

8.7 Traffic

The current background traffic volumes on the various access routes to the 6 proposed sites indicate sufficient capacity to accommodate the generated traffic with a volume/capacity ratio (V/C ratio) well below 0.5 (Assume 1800 vehicle/hour for capacity considerations).

Two secondary counting stations exist along the N11, one north of Amersfoort, (Number 186) and one south of Amersfoort (number 379). Counts exist for 2001 and 2003 at these two stations. Additional traffic counts will be conducted at identified intersections for the EIA phase. In addition, access roads to reach each of the identified sites will be determined. These sites will then be compared relative to their access arrangements. The following criteria will be used:

- available capacity on the road network and
- acceptable travel time to and from residential destinations.

The road conditions are generally poor and SANRAL is in the process of upgrading several of their roads in the area, including the N17 which was upgraded in 2006, the N2 which will be upgraded in 2008. The pavement conditions of the N11 from Amersfoort to Volksrust was evaluated in 2004 by SSI and the following conditions were observed:

- Patching occurred over the whole section at a concerning degree;
- Bleeding occurred along most of this section at a small degree; and
- Riding quality is between fair and good.

8.7.1 Conclusions and Recommendations

In the EIA phase, the following will be investigated:

- Impact of all traffic during construction;
- Impact of employee traffic once operational; and
- Impact of coal supply traffic to the existing Majuba Power Station.

It is recommended that a detailed traffic impact study be undertaken for the preferred site/s as determined by this Environmental Scoping Study to identify possible traffic engineering concerns at the specific site/s.

9. CONCLUSIONS AND RECOMMENDATIONS

This revised Environmental Scoping Study (ESS) for the proposed establishment of a Combined Cycle Gas Turbine (CCGT) power plant has been undertaken in accordance with the Environmental Impact Assessment Regulations (2006) published in Government Notice R385 to R387 of 21 April 2006 in terms of Section 24(5), read with Section 44, of the National Environmental Management Act, 1998 (Act No. 107 of 1998)

In line with Regulation 29 (Chapter 3) of the EIA Regulations, this issues-based ESS aimed to identify and provide:

- information on the methodology applied to assess the potential impacts that have been identified;
- *feasible* and *reasonable* alternatives that have been considered as part of the Scoping Process;
- a description of the environmental issues and potential impacts associated with all aspects of the proposed project.

From the earlier Screening exercise and the above process three (3) candidate sites were nominated for the location of the proposed CCGT power plant and associated infrastructure, for detailed study within the Environmental Impact Assessment (EIA) Phase;

The conclusions and recommendations of this revised Scoping Study are the result of both desk-top studies and on-site inspections conducted by the environmental specialist team.

This issues-based Environmental Scoping Report (ESR) evaluated three candidate sites identified as feasible sites for the construction of the CCGT power plant. The sites are located on the farms as shown in Figure 9.1:

SITE NUMBER	FARM	PORTION
Revised site 2A (which includes the old mine)	Bergvliet 65 HS Rietpoort 83 HS Werda 116 HS	Portion 7 Portion 4 Portion 29 of Bergvliet 65 HS and Remainder of the farm Rietpoort 83 HS
2B	Rietpoort 83 HS Werda 116 HS	Portions 3 and 4 Portion 29 of Bergvliet 65 HS and Remainder of the farm Rietpoort 83 HS
4	Rietpoort 83 HS Welgedacht 82 HS	Portion 1 Portions 2, 6 and 7

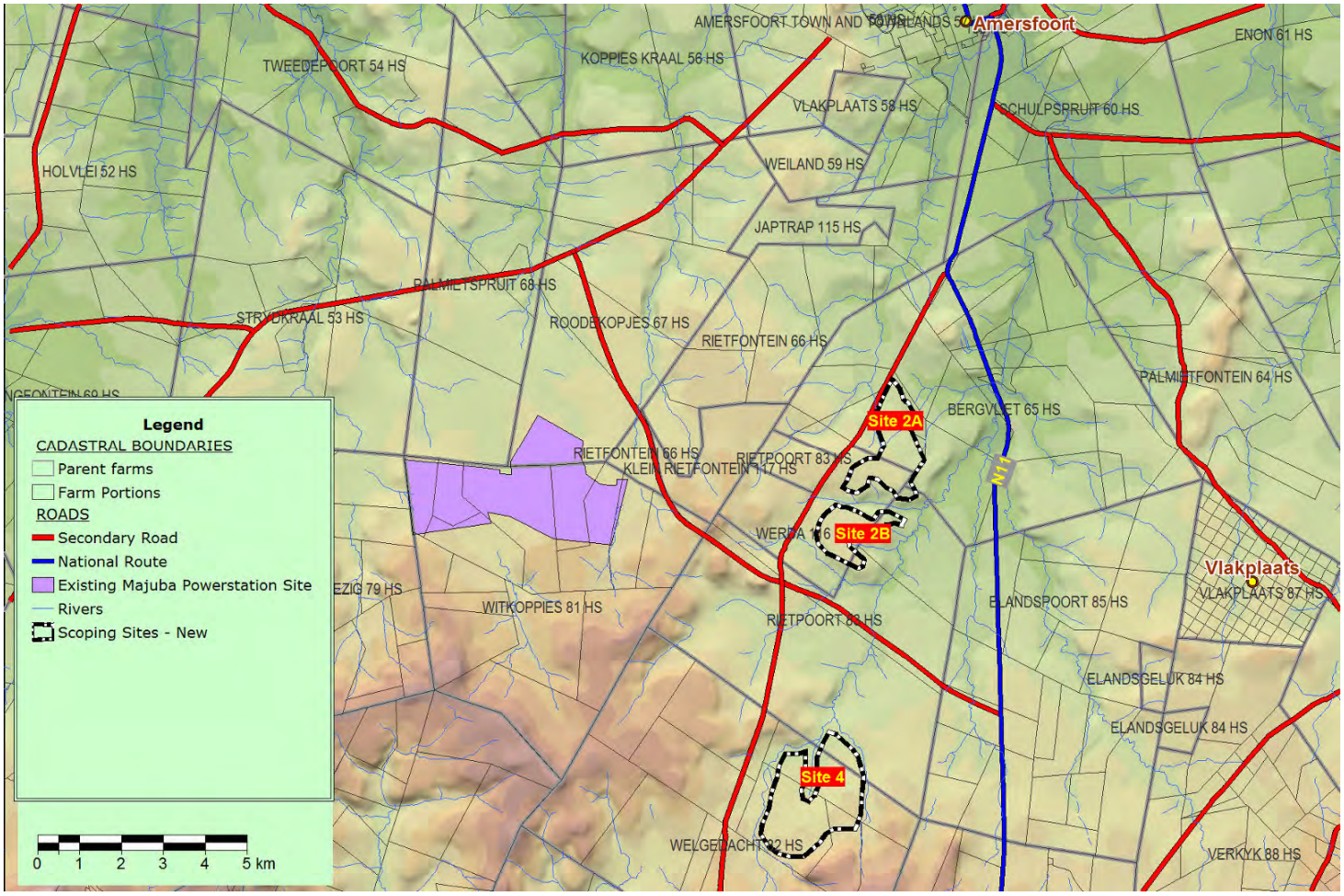

Figure 9.1 Map showing the three (3) candidate sites evaluated in this revised Scoping Study

9.1 Potential Environmental Impacts

A summary of the potentially significant issues associated with the proposed CCGT power plant, identified within the revised Environmental Scoping Study, is provided in Table 9.1 below. Specialist input was received for the following disciplines: Hydrogeology; Hydrology; Biodiversity; Soils and Agricultural Potential, Wetlands, Air Quality; Noise; Social; Visual; Heritage; Risk and Traffic. The area of potential impact and recommendations for investigations to be undertaken within the EIA phase are also specified.

Table 9.1 Potentially significant issues associated with the proposed CCGT power plant, identified within the revised Environmental Scoping Study. The area of potential impact and recommendations for investigations to be undertaken within the EIA phase are also specified.

Issue	Area of Potential Impact	Recommendations
Biophysical Environment		
Hydrogeology	The following potential impacts have been identified: • Raw water dams – sources of artificial recharge to groundwater. • Water (neutralized) storage tanks – possible sources of artificial recharge. • Sewage plant and dams – seepage of irrigation of effluent may impact on groundwater. • Treated (demineralised) water system – resultant wet waste brine may impact on groundwater • Fuel oil and stored chemicals - oil/chemicals enters water and requires treatment. • Solid waste site - source of leachate or poor quality water. • Borrow pits - reduced runoff and enhanced recharge. • Air quality abatement technology - wet waste and water use (if used).	• During the EIA study additional site-specific groundwater data will be compiled. The data will be obtained from a hydrocensus on the selected sites. It is proposed that due to lack of hydrochemical data, groundwater samples will be collected from existing boreholes, where possible. • Groundwater levels, borehole yields, and usage will be determined to assist in assessing possible impacts on the groundwater resources. This data plus additional CCGT details will be compiled in a detailed hydrogeological study (a risk assessment) to aid in developing optimal mitigation and management plans to reduce the impact of the CCGT power plant on the groundwater regime.
Hydrology	The following potential impacts have been identified: • Impact of flooding on the CCGT power plant – infrastructure need to be placed out of flooding area to avoid expensive infrastructural damage, ensure safety of those using the infrastructure, protect water courses from pollution during floods and protect the riparian areas around water courses. • Slope area – steeper slopes produce quicker and large storm water runoff flows which are more likely to result in erosion	• It is recommended that a full EIA study be done. This process will entail a thorough examination of the sites, and from a hydrology perspective, making informed assessments as to the repercussions of the proposed CCGT power plant on the surface water resources locally and regionally with a view of both the primary and secondary effects.

Issue	Area of Potential Impact	Recommendations
	and sediment transport.	• Appropriate site-specific mitigation measures will be recommended for inclusion into the EMP.
Biodiversity (Fauna and Flora – terrestrial and aquatic)	Potential impacts include: • Destruction of threatened species and habitat. • Destruction of sensitive habitat types (outcrops, riparian fringes, non-perennial streams, river, etc.). • Destruction of pristine habitat. • Changes in the local and regional biodiversity. • Impacts on surrounding natural habitat and species.	• A detailed assessment of the selected overall preferred alternative sites will be undertaken within the EIA phase in order to adequately assess the potential impacts on terrestrial and aquatic vegetation as a result of the proposed project and recommend appropriate, site-specific mitigation measures where required.
Soils and Agricultural Potential	• Construction activities will entail removal of soil for the building of structures and foundations as well as vehicle movement and informal and temporary dumping sites. All areas impacted by building activities will be disturbed and it is highly unlikely that the soils could recover to pre-disturbance conditions. This may reduce arable soil.	• A detailed assessment of the selected overall preferred alternative sites will be undertaken within the EIA phase in order to adequately assess the potential impacts on soils and agricultural potential as a result of the proposed project and recommend appropriate, site-specific mitigation measures where required.
Wetlands	• If the CCGT plant and associated infrastructure is located within a wetland, then the wetland is likely to be completely transformed, resulting in the complete loss of wetland habitat as well as functionality of the affected part of the wetland (and possibly the functionality of the downstream portion of the wetland). • Pipelines – If the pipelines are placed above ground, they may affect wetlands, as they would need to cross the wetlands and	• A detailed on-site delineation and assessment of the wetlands occurring on the three sites as well as an assessment of the potential impact of the proposed plant on the wetlands utilising the technical information related to the plant that is currently outstanding will need to be undertaken in the EIA phase. A wetland integrity assessment will also be undertaken.

Issue	Area of Potential Impact	Recommendations
	the support structures for the pipeline may need to be placed within the wetland. Other potential impacts relating to the construction and operation of pipelines through wetlands are: ∗ The pollution of water within the wetland, through construction activities, or through a spill once the pipeline becomes operational; ∗ The incorrect re-instatement of wetland vegetation that may result in the exposing and erosion of wetland soils, and ∗ The compaction of wetland soils through the use of machinery in the wetland. • Access roads - The potential impacts of access roads on wetlands are similar to the impacts associated with pipelines, but the primary potential impacts on wetlands are: ∗ The alteration of the hydrology and hydromorphology of the wetland due to the placing of the road in the wetland; if too few culverts are placed under the road, the road will act as an impoundment. ∗ The physical disturbance of wetland soils and vegetation by construction activities that may lead to erosion of wetland soils. ∗ The introduction of pollutants and other toxicants into the wetland from stormwater off the road that carries fuel / oil spilt onto the road surface. • The water treatment and sewage treatment plants may be associated with discharge of water into the wetlands and	

Issue	Area of Potential Impact	Recommendations
	drainage systems.	
Social Environment		
Air Quality	The following possible sources of fugitive dust and particulate emissions were identified as activities which could potentially generate air pollution during construction operations: • Demolition and debris removal. • Site preparation (earthworks). • General construction. The following possible sources of fugitive dust and particulate emissions were identified as activities which could potentially generate air pollution during operation: CCGT power plant (comprising 6 units of approximately 350MW each); compressor plant; ignition gas for unit start-up (using commercial propane); gas pipeline from the UCG plant to the CCGT; construction of the water supply pipeline from the Rietpoort balancing dam; water treatment plant and associated infrastructure (i.e. ancillary works); sewage treatment plant; an general storage facilities. • Possible sources of fugitive dust emission during the closure and post-closure phase include: grading of sites; infrastructure demolition; infrastructure rubble piles; transport and dumping of building rubble; transport and dumping of topsoil; and preparation of soil for revegetation.	• Based on available information, no fatal flaws are associated with the proposed project in the sites studied. • A detailed assessment of the selected alternative sites will be undertaken within the EIA phase in order to adequately assess the potential impacts on air quality as a result of the proposed project and recommend appropriate mitigation measures, where required.

Issue	Area of Potential Impact	Recommendations
Noise	Potential noise impacts consist of the following: • Impacts on the residual (existing) noise climate. • Predicted noise climate – pre-construction phase. • Predicted noise climate – construction phase. • Predicted noise climate – operational phase ∗ CCGT power plant. ∗ CCGT power plant generated traffic.	• Once the preferred site/s is selected, detailed analysis of the noise impact situation will need to be undertaken and mitigation measures recommended, where possible. .
Social Impact Assessment	The following are likely to have an impact on the social environment: • *Demographic change processes* ∗ Relocation of households and/or population segments ∗ Influx of construction workers ∗ Influx of job seekers ∗ Influx of maintenance workers • *Economic change processes* ∗ Land acquisition (financial compensation) ∗ Direct formal employment opportunities to local individuals Indirect formal and/or informal employment opportunities to local individuals • *Empowerment and institutional change processes* ∗ Attitude formation against the proposed project ∗ Negotiation process ∗ Additional demand on municipal services • *Socio-cultural processes* ∗ Integration of construction workers into local areas ∗ Traffic movement	• A detailed assessment of the selected alternative sites will be undertaken within the EIA phase in order to adequately assess the potential impacts on the social and micro-economic environment as a result of the proposed project and recommend appropriate mitigation measures, where required.

Issue	Area of Potential Impact	Recommendations
	∗ Safety and security ∗ Noise pollution ∗ Sense of place ∗ Third party tampering (on pipelines) • *Geographical change process* ∗ Cultivated and grazing land ∗ Maintenance of access roads ∗ Tourism potential • *Biophysical change process* ∗ Pollution and fire risk ∗ Sanitation ∗ Mining operations ∗ The presence of the CCGT plan and pipelines	
Visual	Due to the large footprint and vertical dimensions of the proposed CCGT power plant, and the predominantly flat topography of the region, it becomes apparent that the facility would be well exposed. The issues relating to visual impact are the following: • Visibility • Proximity • Exposure	• A detailed assessment of the selected alternative sites will be undertaken within the EIA phase in order to adequately assess the potential visual impacts as a result of the proposed project and recommend appropriate mitigation measures, where required.
Heritage	The potential impacts on heritage during the construction phase are as follows: • Actually identified impacts ∗ Damage to sites	• One site of cultural significance was identified to exist on the farm Welgedacht 82HS (Site 4). As few other sites are known from this region, this site would have a high significance on a regional level. In terms of Section 7 of the NHR Act, No. 25 of

Issue	Area of Potential Impact	Recommendations

	• Anticipated impacts
	  ∗ Looting of sites
	The potential impacts on heritage during the operational phase are as follows:
	• Actually identified impacts
	  ∗ Damage to sites
	• Anticipated impacts
	  ∗ Damage to sites
	  ∗ Looting of sites
		1999, this site would have Grade II significance.
		• The preferred alternative sites will be investigated in more detail through a Phase 1 archaeological study. The final layout must attempt to avoid significant sites; if this is not possible, detailed, site-specific mitigation and mitigation measures will then be recommended in the detailed EIA phase. This should be developed in consultation with the Mpumalanga SAHRA office.

Risk	A risk assessment on human health due to the CCGT power plant would concentrate on possible fires, explosions and toxic clouds from an accidental release of the gas.	• The further people are located from the point of release, the less they would experience the impact of an accidental release. As all the prospective sites are located in rural areas with some distance to larger populations, differences in risk between the sites would not be sufficient to give a site preference. • A detailed assessment of the selected alternative sites will be undertaken within the EIA phase in order to adequately assess the potential risk impacts as a result of the proposed project and recommend appropriate mitigation measures.
Traffic	• Impact of all traffic during construction. • Impact of employee traffic during operation. • Impact of coal supply traffic to the existing Majuba Power Station.	• A detailed traffic impact study will be undertaken for the preferred sites as determined by this Environmental Scoping Study to identify possible traffic concerns for the specific sites.

9.2 Recommendations

Based on the specialist studies, **no** environmental fatal flaws have been identified as a result of the proposed project on any of the sites evaluated. However, a number of potentially significant environmental impacts have been identified that requires further in-depth study.

Therefore, an EIA is to be undertaken in order to provide an assessment of these potential impacts and recommend appropriate mitigation measures, where required.

In the consideration of the environmental, social and economic criteria along with the technical criteria, the nominated sites for further study within an environmental impact assessment would be:

SITE NUMBER	FARM	PORTION
Revised site 2A (which includes the old mine)	Bergvliet 65 HS Rietpoort 83 HS Werda 116 HS	Portion 7 Portion 4 Portion 29 of Bergvliet 65 HS and Remainder of the farm Rietpoort 83 HS
2B	Rietpoort 83 HS Werda 116 HS	Portions 3 and 4 Portion 29 of Bergvliet 65 HS and Remainder of the farm Rietpoort 83 HS
4	Rietpoort 83 HS Welgedacht 82 HS	Portion 1 Portions 2, 6 and 7

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