ANKERLIG POWER STATION CONVERSION AND INTEGRATION PROJECT, WESTERN CAPE PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PLAN (EMP):

ADDENDUM TO THE ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE ANKERLIG OPEN CYCLE GAS TURBINE POWER STATION IN THE ATLANTIS AREA, WESTERN CAPE PROVINCE (REVISION 1 OF THE EMP DATED SEPTEMBER 2007)

Submitted as part of the EIA Report

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PROJECT DETAILS

DEAT Reference No.	:	12/12/20/1014 (power station conversion) 12/12/20/1037 (transmission power line)
Title	:	Environmental Impact Assessment Process Draft Environmental Impact Assessment (EIA) Report: Proposed Ankerlig Power Station Conversion and Transmission Integration Project, Western Cape Province
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Client	:	Eskom Holdings Limited (Eskom Generation Division)
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DEFINITIONS AND TERMINOLOGY

The following should be read in conjunction with the Glossary of Terms and Abbreviations section of the Ankerlig Open Cycle Gas Turbine Power Station EMP (refer to page 2 of Ankerlig Power Station EMP).

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

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

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

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

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

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

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

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

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

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OVERVIEW OF THE PROJECT CHAPTER 1

1.1. Description of the Proposed Project

Eskom Holdings Limited (Eskom) is investigating the conversion of the nine Open Cycle Gas Turbine (OCGT) units at the existing Ankerlig Power Station (located in Atlantis Industria) plant to a Combined Cycle Gas Turbine (CCGT). This would increase the generating capacity of this existing power station by a maximum capacity of 720 MW. The proposed conversion would involve the addition of Heat Recovery Steam Generators (HRSG) to generate steam, and steam turbines and generators to the existing gas turbine plant (essentially adding a steam cycle to the existing gas cycle), and would be established on the same site as the existing Ankerlig Power Station.

Eskom is also proposing the construction of a 400kV transmission power line between the Ankerlig Power Station and the already authorised Omega Substation (to be located on the Farm Groot Oliphantskop 81) to integrate the additional power generated at Ankerlig Power Station into the national electricity grid.

The Ankerlig Power Station conversion and associated transmission integration project can be seen as a third phase of the original Atlantis OCGT power station project. The construction of the initial OCGT units (i.e. the four units now in operation) was the first phase of the project. The second phase of the project (currently under construction) involves the expansion (capacity increase) of the power station by adding another five OCGT units, four fuel tanks and a switchyard to the power station.

1.2. Description of the proposed Power Station Conversion

The existing Ankerlig OCGT Power Station is located on the Remainder of Farm No 1395 in the Atlantis Industrial Township, which is located ~40 km from the Cape Town city centre. The Ankerlig OCGT Power Station consists of nine OCGT units (i.e. four existing OCGT units, plus an additional five OCGT units currently under construction) each with a nominal capacity of approximately 150 MW, resulting in a total nominal capacity of approximately 1 350 MW for the power station.

Each OCGT unit consists of one gas turbine driving an electric generator. The concept of converting the OCGT units to CCGT units is to utilise the **heat energy** from the exhaust of the gas turbine to create steam in the Heat Recovery Steam Generator (HRSG), to drive a steam turbine, instead of this heat energy being exhausted and lost to the atmosphere (as is the current scenario). Conversion of the units to CCGT is therefore based on increased cycle efficiency.

Simply stated, this can be achieved through the following (and is illustrated in Figure 1.1):

» When the hot gas exits the gas turbine as exhaust gas, it has a temperature of up to 600°C. This heat energy is transferred to water in the heat recovery steam generator, instead of being exhausted to the atmosphere.
» The heat is used to generate steam (water vapour), which powers the steam turbine to produce mechanical energy.
» The resulting mechanical energy is transferred to a generator, where it is converted into electricity.

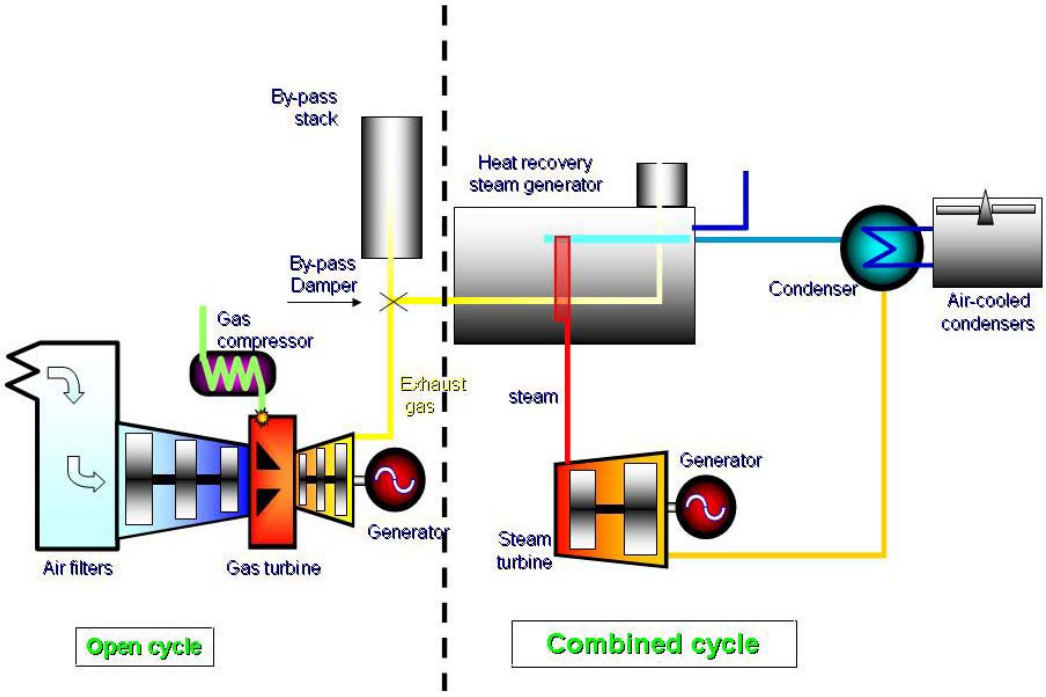

Figure 1.1: Simplified schematic illustrating the CCGT conversion process and components

Conversion of the units to CCGT is undertaken to increase cycle thermal efficiency. It is estimated that each converted unit will produce approximately 80 MW additional capacity, i.e. approximately 50% more than a standard OCGT unit. Therefore, an additional 9 x 80 MW increase in capacity (approximately 720 MW total) is foreseen from the OCGT to CCGT conversion. The total nominal capacity of the Ankerlig Power Station will therefore increase to approximately 2 070 MW.

The proposed conversion will be on the site of the existing Ankerlig Power Station, and will not require any additional land take outside of the existing power station boundaries (refer to Figure 1.2).

Figure 1.2: Aerial photograph of the Ankerlig Power Station site showing the existing power station infrastructure the power station expansion site, as well as the areas for the placement of infrastructure associated with the proposed power station conversion

The primary components of the conversion project include the following:

» A **heat recovery steam generator** (HRSG) will be added to the gas turbine to recover waste heat, to drive the steam turbine cycle. In principle, a HRSG is associated with a gas turbine. One HRSG can be linked to 2 or 3 OCGT units.
» A **condenser** which converts exhaust steam from the steam turbine back into water through a cooling process.
» Depending on the configuration, a **bypass stack** for the CCGT, anticipated to be approximately 60 m in height will be associated with each HRSG.
» **Water treatment plant** (for treatment of potable water and production of demineralised water (for steam generation). A **waste disposal system** for the effluent from this water treatment system will be required.
» **Dry-cooled technology** consisting of a system of air-cooled condenser fans situated in fan banks approximately between 25-30 m above ground.
» **Additional fuel storage facilities** and associated off-loading and other related infrastructure to cater for the increased fuel requirements associated with the higher load factor (i.e. longer operating hours or a mid-merit operating regime[1]).
» An **elevated water tank**, approximately 20m high, with a holding volume of approximately 2.5 million litres (i.e. water storage for approximately 5 days of operation).

It is important to note that the plant can use liquid fuel or natural gas as fuel. It is envisaged that the CCGT units would initially be diesel-fired, until such time that natural gas becomes available, if it becomes available.

1.2.1. Potential Environmental Impacts associated with the Proposed Power Station Conversion

All components of the proposed power station conversion project will be on the site of the existing Ankerlig Power Station, and will not require any additional land take outside of the existing power station boundaries. Potential impacts associated with the proposed power station conversion project are expected to occur during both the construction and operational phases. In general, impacts are expected to be similar to those associated with the initial phases of the power station project (i.e. the initial 4 OCGT units currently in operation, and the additional 5 OCGT units currently under construction). New impact sources associated with the power station conversion project would include:

» **Visual impacts** as a result of the additional infrastructure associated with the conversion project to be added onto the existing power station (i.e. the heat recovery steam generator (HRSG), the 60 m high stacks, the 25 m - 30 m high air-cooled condensers, the additional fuel storage tanks and the water reservoir).

[1] Mid-merit capacity is during the daytime from about 6 am to about 10 pm on weekdays.

» **Air quality impacts** associated with the construction phase (dust) and the operational phase (emissions from the power station).
» **Noise impacts** associated with the existing OCGT units as well as the additional CCGT components to be added onto the existing power station (i.e. air filters, the gas compressor, the gas turbine, the generator, the electricity transformers, the fans associated with the stacks, the heat recovery equipment, the steam generator, the steam turbine and the air-cooled condenser system associated with the dry-cooling system).
» **Impacts on the social environment** as a result of the creation of employment opportunities, influx of workers to the area, traffic movements, and impacts on sense of place.
» **Traffic and transportation impacts associated with the transportation of additional fuel to the power station site** as a result of the need to operate the power station at a higher load factor (i.e. for longer hours) than is currently the case.

No environmental fatal flaws have been identified to be associated with the proposed power station conversion project. It was concluded that the impacts could be successfully mitigated through the implementation of the management measures detailed in Ankerlig OCGT Power Station EMP (Revision 1 dated September 2007) as well as this addendum to the approved EMP.

1.3. Description of the proposed Transmission Integration Project

A 400kV transmission power line is required to be constructed between the Ankerlig Power Station and the Omega Substation (authorised but not yet constructed, and to be located on the Farm Groot Oliphantskop 81) to integrate the additional power generated at this power station to the national electricity grid. The existing substation (high voltage (HV) yard) at the Ankerlig Power Station will be utilised, and no additional infrastructure or expansion of this HV yard is required to accommodate the new transmission power line.

From the specialist studies undertaken in the Environmental Impact Assessment (EIA), It is concluded that the adoption of Alternative A (refer to Figure 1.3) would have the lower impact on the overall environment. In addition, this alternative is preferred from a technical perspective as it would allow for future power lines exiting the Koeberg Nuclear Power Station site.

1.3.1. Potential Environmental Impacts associated with the Proposed Transmission Integration Project

Potential impacts associated with the proposed transmission power line are expected to occur during the construction and operational phases, and have been identified to include:

- **Impacts on flora and fauna** as a result of the disturbance of habitats within the power line servitude and at tower footprints.
- **Impacts on heritage sites** as a result of disturbance or destruction during the construction phase, as well as due to visual impacts on heritage sites.
- **Visual impacts** on the surrounding area.
- **Impacts on the social environment** as a result of the creation of employment opportunities, influx of workers to the area, impacts on land use, and impacts on sense of place.

No environmental fatal flaws have been identified to be associated with the proposed transmission integration project, provided the nominated preferred alternative is implemented. It was concluded that the impacts could be successfully mitigated through the implementation of the management measures detailed in Ankerlig OCGT Power Station EMP (Revision 1 dated September 2007) as well as this addendum to the approved EMP.

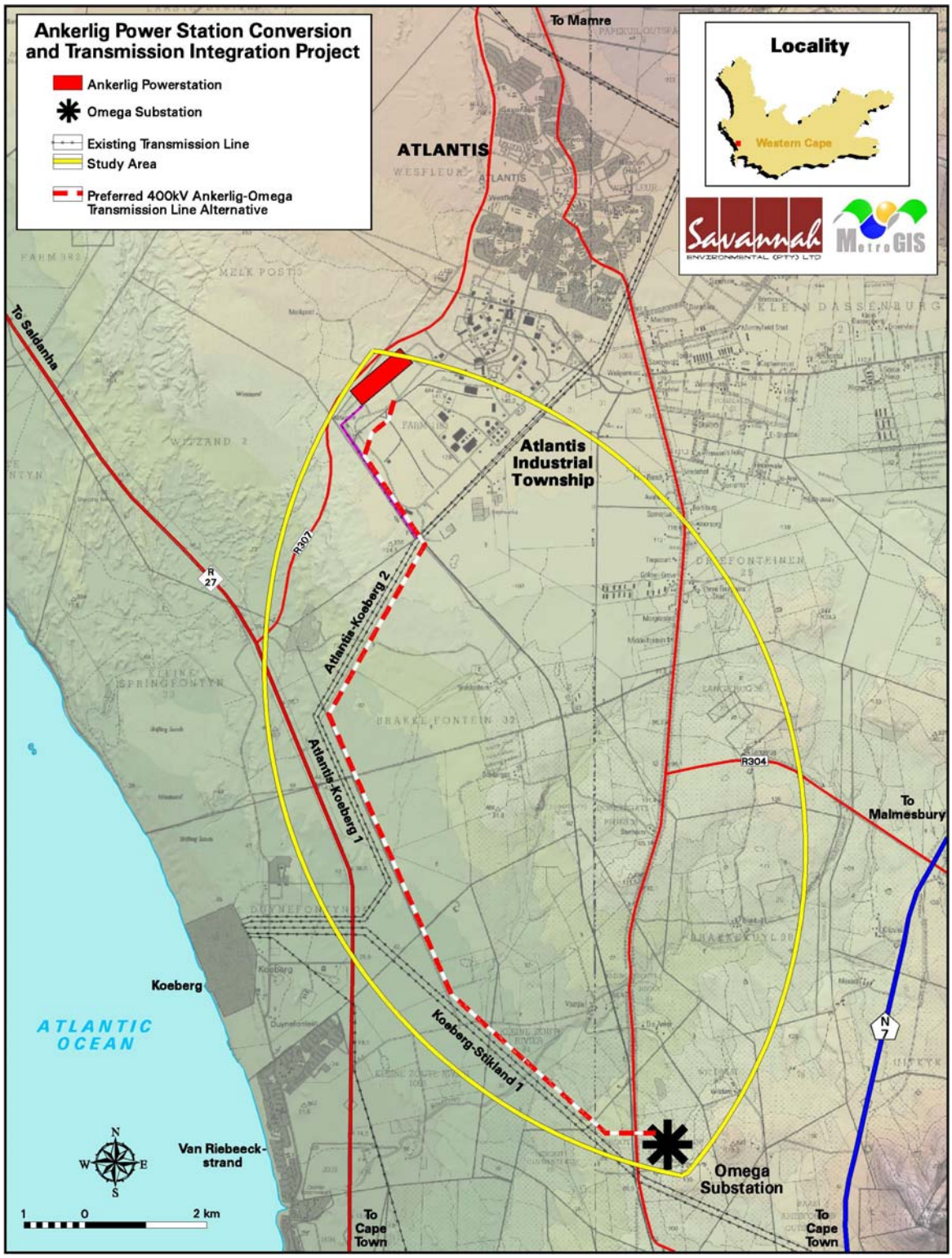

Figure 1.3: Locality map indicating the nominated preferred alternative for the Ankerlig-Omega 400kV transmission power line

PURPOSE & OBJECTIVES OF THE EMP ADDENDUM CHAPTER 2

An Environmental Management Plan (EMP) provides a link between the impacts predicted and mitigation measures recommended within the EIA report, and the implementation activities of a project to ensure that these activities are managed and mitigated so that unnecessary or preventable environmental impacts do not result.

Eskom have an approved EMP in place for the construction, operation and maintenance activities associated with the Ankerlig OCGT Power Station (refer to the EMP (Revision 1 dated September 2007)). This EMP is currently successfully utilised and in force at the operational 4 units of the OCGT power station (and associated 400 kV transmission power lines), and on the construction site for the additional 5 units. Regular compliance audits to the EMP requirements are undertaken by the Environmental Control Officer and an external auditor. As such, it is not deemed necessary to reiterate all the specifications of this approved EMP which are currently being applied to all components of the bigger Ankerlig OCGT Power Station project, and therefore this *addendum to the approved EMP* has been prepared to specifically address the potential impacts resulting from the power station conversion and transmission integration project only.

2.1. Purpose of the EMP and associated Addendums

The purpose of the Ankerlig OCGT Power Station EMP (Revision 1 dated September 2007) as well as this addendum to the approved EMP is to assist in ensuring continuous improvement of environmental performance, reducing negative impacts and enhance positive effects during the construction and operation of the project. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

The draft EMP has the following objectives:

» To outline mitigation measures, and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation/maintenance phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the project.
» To identify measures that could optimise beneficial impacts.
» To ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
» To ensure that all environmental management conditions and requirements as stipulated in the Environmental Authorisation (once issued) are implemented throughout the project life-cycle.

» To ensure that all relevant legislation (including national, provincial and local) is complied with during the construction and operation phases
» To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
» To propose mechanisms for monitoring compliance, and preventing long-term or permanent environmental degradation.
» To facilitate appropriate and proactive response to unforeseen events or changes in project implementation that were not considered in the EIA process.

This addendum to the approved EMP has been developed as a set of environmental specifications (i.e. principles of environmental management) which are appropriately contextualised to provide clear guidance in terms of the implementation of these specifications for the proposed project.

This EMP addendum for the proposed Ankerlig Power Station conversion and transmission integration project has been compiled in accordance with Section 34 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. It should be noted that since this addendum to the EMP is part of the EIA process undertaken for the proposed project, it is important that this document be read in conjunction with the Scoping Report (March 2008) and EIA Report (September 2008). This will contextualise the EMP addendum. This addendum to the approved EMP must be read in conjunction with the relevant sections and appendices of the Ankerlig OCGT Power Station EMP (Revision 1 dated September 2008).

2.2. Structure of the Addendum to the EMP

Several procedures are necessary for Eskom to achieve environmental compliance for the Ankerlig Power Station and transmission integration project. These are described in further detail within the Ankerlig OCGT Power Station EMP (Revision 1 dated September 2008). In order to ensure site-specific compliance associated with the proposed power station conversion and transmission integration, this EMP addendum includes the statement of an over-arching environmental **goal**, as well as lists a number of **objectives** in order to meet this goal. The management plan has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions monitoring requirements and performance indicators. A specific environmental management plan table has been established for each environmental objective. The information provided within the EMP table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies

Project component/s	List of project components affecting the objective
Potential Impact	Brief description of potential environmental impact if objective is not met
Activity/risk source	Description of activities which could impact on achieving the objective
Mitigation: Target/Objective	Description of the target; include quantitative measures and/or dates of completion

Mitigation: Action/control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting

2.3. Project Team

Jo-Anne Thomas, the principle author of this addendum to the Environmental Management Plan, is a registered Professional Natural Scientist (in the practice of environmental science) with the South African Council for Natural Scientific Professions. She has extensive knowledge and experience in environmental impact assessment and environmental management, having being involved in EIA processes over the past ten (10) years.

MANAGEMENT PLAN: PLANNING & DESIGN CHAPTER 3

3.1. Goal for Planning

Overall Goal for Planning: Undertake the planning phase of the Ankerlig Power Station conversion and Transmission Integration Project in a way that:

» Ensures that the planning of the project components responds to the identified environmental constraints and opportunities.
» Ensures that adequate regard has been taken of landowner concerns and that these are appropriately addressed through planning and design (where appropriate and possible).
» Ensures that the best environmental options are selected for the required construction and operation activities associated with the project.
» Enables the required construction activities to be undertaken without significant disruption to other land uses in the area.

This addendum to the approved EMP must be read in conjunction with the relevant sections and appendices of the Ankerlig OCGT Power Station EMP (Revision 1 dated September 2008).

3.2. Objectives for Planning

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: To ensure that the planning of the project responds to the identified environmental constraints and opportunities

Once the final transmission power line alignment has been negotiated, surveyed and pegged, a walk-through survey must be undertaken by a suitably qualified heritage specialist in order to determine whether any heritage sites of significance would be impacted by the proposed power line towers. The findings of this specialist survey must be incorporated into this EMP, such that it is updated to include site-specific information which must be incorporated into the construction and operation phases of the project.

From the studies undertaken, it was concluded that walk-through surveys by an ecologist and ornithologist are not required as this would not add any significant value to the outcomes of the EIA process.

Project component/s	Project components affecting the objective: » CCGT gas turbine units, water reservoir, fuel storage tanks and lighting structures » Power line towers » access roads
Potential Impact	» Design fails to respond optimally to the environmental consideration » Power line route that degrades environment unnecessarily, particularly with respect to visual aesthetics, loss of indigenous flora, erosion, and impacts on local communities/residents » Unacceptable noise and air emissions from power station components » Potential exposure to and visual impact on observers travelling along the Dassenberg Road
Activities/risk sources	» Alignment of power line and positioning of towers and access roads within the approved power line corridor » Positioning of the power station components within the Ankerlig Power Station footprint » Establishment of power station components within the Atlantis Power Station footprint alongside Dassenberg Road
Mitigation: Target/Objective	» To ensure that the design of the project components respond to the identified environmental constraints and opportunities » To ensure selection of best environmental option for the power station conversion and alignment for the power line » To shielding the project infrastructure in order to not visually impose on road users on Dassenberg Road.

Mitigation: Action/control	Responsibility	Timeframe
Undertake appropriate pre-construction planning, including a master plan indicating site layout, infrastructure placement (away from the Dassenburg Road) and the potential vegetated berm.	Eskom/landscape architect/engineer	Pre-construction
Ensure that appropriate planning is undertaken regarding the placement of any additional lighting structures and that light fixtures are designed such that they only illuminate areas inside the power station facility.	Eskom/lighting engineer	Design
In order to reduce the overall noise and air emissions to acceptable levels, final design of equipment will ensure the level of noise and air emissions from the plant must be limited to levels guaranteed by the contractor.	Eskom/design engineer	Design
Noise mitigation measures to include in design include: • Increased boiler casing thickness. • Stack exit silencer and transition barrier. • Pumps inside enclosure. • Steam turbine inside high STC enclosure. • Low noise fans with inlet and exit silencers and	Eskom/design engineer	Design

Mitigation: Action/control	Responsibility	Timeframe
larger footprint		
Additional infrastructure on the power station site (such as the water reservoir and fuel storage tanks) should be set back (further away) from the road as far as possible	Eskom/design engineer	Design
The viability of the construction of a 5 to 10 m tall vegetated screening berm between the Dassenburg Road and the power station site should be investigated.	Eskom/design engineer	Design
Undertake negotiations with affected landowners within the approved power line corridor and agree on landowner-specific conditions for construction and maintenance	Negotiator	Planning Phase
Undertake a detailed geotechnical survey of the proposed transmission line tower positions in order to fully understand the soils in terms of founding conditions and erosion potential	Eskom	Design Phase
Consider planning and design level mitigation measures recommended by the specialists.	Engineering Design Consultant	Design Phase
The realignment of the preferred power line alignment to facilitate the crossing of the R303 adjacent to (in closer proximity to) the existing power lines, should this be technically feasible.	Eskom Transmission design team	Design Phase
Ensure that bird-friendly power line tower and conductor designs are used.	Eskom Transmission design team	Design Phase
Ensure that no towers or tracks are placed in the wetland areas indicated in the High sensitivity patches in southern half of the power line alignment (as indicated in the EIA Report).	Eskom Transmission design team	Design Phase
Balance technical and financial considerations against environmental constraints and opportunities in finalising the design of key elements (such as the power station components (in terms of noise and air emission mitigation), tower design and required (servitude width).	Eskom	Tender Design & Design Phase
Ensure that any new access road required for accessing the power line are designed to allow for the natural flow of water where required. Crossing of eroded areas on access routes to the power line servitude shall be thoroughly planned and installed according to design and contract specifications.	Engineering Design Consultant	Design Phase

Performance Indicator	» Design meets objectives and does not degrade the environment » Design and layouts etc respond to the mitigation measures and recommendations in the EIA report.

	» Final installed power station components minimises any negative environmental impacts and maximises any benefits. » Final surveyed route alignment minimises any negative environmental impacts and maximises any benefits.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the EIA report through review of the design by the Project Manager and Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE: To ensure adequate regard has been taken of landowner concerns along the power line alignment and that these are appropriately addressed

Transmission power lines are constructed and operated within a servitude (55 m wide for 400kV lines) that is established along the entire length of the power line, and for which the affected landowner is appropriately compensated. Within this servitude, Eskom has certain rights and controls that support the safe and effective operation of the power line. The negotiation process for this servitude is undertaken by Eskom directly with the appropriate landowner and culminates in the signing of a servitude agreement. Here Eskom enters into a legal agreement with the landowner. The agreements will detail such aspects as the exact location and extent of the servitude, and access arrangements and maintenance responsibilities, as well as any specific landowner requirements for construction and maintenance of the power line, as well as regarding rehabilitation measures.

Project component/s	Project components affecting the objective: » Power line » access roads
Potential Impact	» Landowners impacted by proposed alignment of the power line, positioning of towers and access road/s » Impacts on current and future land use activities
Activities/risk sources	» Positioning of towers and access roads » Alignment of power line and placement of towers within the approved corridor
Mitigation: Target/Objective	» To ensure adequate regard has been taken of concerns of affected and surrounding landowners and that these are appropriately addressed

Mitigation: Action/control	Responsibility	Timeframe
Initiate negotiations with landowners timeously.	Eskom Lands and	Initiate once

Mitigation: Action/control	Responsibility	Timeframe
Address reasonable expectations/requests of landowners, where possible.	Rights	Environmental Authorisation obtained. Finalised prior to construction.
Avoid the resettlement and/or displacement of households as far as possible. If resettlement is unavoidable, residents shall be sufficiently compensated and assisted with the relocation process (if required).	Eskom Lands and Rights	Planning phase

Performance Indicator	» Landowners should be satisfied with the outcome of the negotiations process. » Landowners should be afforded reasonable and appropriate rights/access.
Monitoring	» Not applicable

MANAGEMENT PLAN: CONSTRUCTION CHAPTER 4

4.1. Overall Goal for Construction

Overall Goal for Construction: Undertake the construction phase in a way that:

» Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
» Enables the construction activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, farming practices, traffic and road use, and effects on local residents.
» Minimises the impact on the vegetation and habitats within the area.
» Minimises the impact on the archaeological and historical value of the area, and where possible adds to the archaeological record of this area.
» Minimises impacts on birds and terrestrial fauna within the study area.

This addendum to the approved EMP must be read in conjunction with the relevant sections and appendices of the Ankerlig OCGT Power Station EMP (Revision 1 dated September 2008). This addendum relates only to activities associated with the Ankerlig Power Station Conversion and Transmission Integration Project. Generic environmental specifications and guidelines included within this approved EMP are not repeated here.

4.2. Objectives for Construction

In order to meet the goals, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: maintain the construction noise levels around the power station site within acceptable levels and minimise the impact on residential areas and communities

Project component/s	» Construction activities during the construction phase
Potential Impact	» Noise impacts on surrounding areas
Activity/risk source	» Construction activities, i.e. excavating, loading and unloading of trucks, piling, material transport, general building activities, etc.
Mitigation: Target/Objective	» Minimise noise impacts during the construction phase

Mitigation: Action/control	Responsibility	Timeframe
Regular maintenance of equipment and fitting of silencers where appropriate.	Contractor in consultation with Specialist	Duration of contract
Training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.	Contractor in consultation with Specialist	Duration of contract
Restricting noisy operation such as piling or rock breaking, etc. to daytime hours.	Contractor	Duration of contract

Performance Indicator	» No complaints regarding noise during construction activities » The measured noise levels around the boundary of the site to be less than 70 dBA during day-time and 60 dBA during night-time. » The noise levels in Avondale and Protea Park residential areas not to exceed 50 dBA and 45 dBA during daytime and night-time respectively, due to the power station operations.
Monitoring	» Biannual noise monitoring during construction lifespan on power station perimeter. The closest residential area to the site and at two selected locations outside the perimeter should also be included. » The noise monitoring should be performed in accordance with SANS 10103 and the report submitted to the appropriate authority. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Management of dust and emissions to air

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the construction site.

Project component/s	Project components affecting the objective: » Combined cycle units » Power line » Access roads
Potential Impact	» Dust and particulates from vehicle movement to and on-site, foundation excavation, access road construction and maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility » Release of minor amounts of air pollutants (for example NO_2, CO, PM10 and SO_2) from vehicles and construction equipment
Activities/risk sources	» Clearing of vegetation and topsoil » Excavation, grading, scraping » Transport of materials, equipment and components on internal access

	roads » Re-entrainment of deposited dust by vehicle movements » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces » Fuel burning vehicle engines
Mitigation: Target/Objective	» To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/control	Responsibility	Timeframe
Access roads must be maintained to a manner that will ensure that dust from road or vehicle sources is not visibly excessive.	Contractor	Erection: during site establishment Maintenance: for duration of contract
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered.	Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the SHE Representative.	Contractor	Duration of contract
Burning or incineration of any materials on-site must be prohibited.	Contractor	Duration of contract
Specific fire safety precautions must be implemented during welding activities associated with the CCGT units and power line construction.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable.	Contractor	At completion of the construction phase
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
If monitoring results or complaints indicate inadequate performance against the criteria indicated, then the source of the problem must be identified, and existing procedures or equipment modified to ensure the problem is rectified.	Contractor	Duration of contract

Performance Indicator	No complaints from affected residents or community regarding dust or vehicle emissions
Monitoring	Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:

	» Visual daily inspections of dust generation by construction activities throughout the construction phase. If considered necessary by the SHE Representative, dust gauges will be installed at nearby residences. » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager or SHE Representative. » A complaints register will be maintained, in which any complaints from residents/the community will be logged. Complaints will be investigated and, where appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Protection of sensitive areas, vegetation and faunal habitats

The construction of the additional fuel storage for the power station conversion and the proposed power line within the servitude requires the clearance of vegetation within the development footprint. Impacts on sensitive areas, vegetation and faunal habitats at the construction stage are expected to be mainly as a result of direct permanent loss of vegetation within the development footprint. In order to minimise impacts on flora, fauna and ecological processes, the development footprint and associated disturbance to topsoil should be limited.

Project component/s	» Additional fuel storage footprint » Power line tower footprints » Access roads
Potential Impact	» Localised loss of sensitive, protected and/or Red Data plant species » Damage to surrounding areas » Damage to/removal of Red Data plant species and sensitive faunal habitats » Disturbance to plant communities and habitats
Activity/risk source	» Clearing and levelling of additional fuel storage area footprint » Clearing of tower footprints, servitude centre line and access roads » Traffic to and from site during all phases of construction (i.e. from surveying to rehabilitation of an area) » Site preparation and earthworks » Excavation of foundations » Mobile construction equipment » Dumping or damage by construction equipment outside of demarcated construction areas
Mitigation: Target/Objective	» Minimise areas of impact adjacent to proposed fuel storage area and power line servitude to retain natural vegetation as far as possible » Store construction materials in low impact area » Implement monitoring programme

Mitigation: Action/control	Responsibility	Timeframe
Search and Rescue of certain translocatable, selected succulents and bulbs occurring in the fuel storage area is recommended. These are to be translocated to an area approved by the ECO.	Contractor in consultation with Specialist & ECO	Pre-construction
Areas to be cleared shall be clearly marked in the field to eliminate unnecessary clearing and impact on flora and faunal habitats is restricted.	Contractor in consultation with Specialist	Pre-construction, site establishment & duration of contract
Avoid the unnecessary removal of vegetation for the transmission power line servitude.	Contractor	Site establishment & duration of contract
Limit access to the power line servitude along existing access roads.	Contractor	Site establishment & duration of contract
Minimise the use of herbicides as far as possible. Where herbicides are required to be used, this shall be undertaken by a registered pest control operator in accordance with the relevant legislation.	Contractor	Duration of contract
Unnecessary disturbance to areas outside of servitude and power station site shall be strictly controlled.	Contractor	Duration of contract
Implement monitoring programme	Ecologist, ECO	Construction
Compile rehabilitation programme for areas adjacent to servitude, and implement as soon as possible after construction is completed in an area.	Contractor in consultation with ECO	Construction phase
The weed eradication programme detailed in Appendix C of the approved EMP (September 2007) shall be implemented.	Contractor in consultation with ECO	Duration of contract

Performance Indicator	» No disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation. » Successful recovery of vegetation in servitudes and other disturbed areas post-construction phase
Monitoring	» Observation and monitoring of vegetation clearing activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Protection of sites of heritage value

Numerous fossil and archaeological sites have been recorded in the broader study area. No specific heritage surveys have been carried out for this project at this stage, as sufficient information was obtainable from existing information.

Heritage sites can be negatively affected by disturbance of the land surface, destruction of significant structures and places as well as any action that will alter the feel and appearance of an historic place or building. Therefore, the construction of the transmission line could result in moderate impacts to the land surface during the construction phase but permanent changes in terms of visual impacts and changes to the feel of a landscape.

Project component/s	List of project components affecting the objective: » Power line towers » access roads
Potential Impact	» Heritage objects or artefacts found during construction are inappropriately managed or destroyed
Activity/risk source	» Site preparation and earthworks » Excavation of foundations » Construction equipment movement on site
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are recorded and/or treated appropriately and in accordance with the relevant legislation

Mitigation: Action/control	Responsibility	Timeframe
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	ECO/specialist	Pre-construction
Should any finds be unearthed during construction activity, an archaeologist and Heritage Western Cape should be informed immediately. The relevant contact person at Heritage Western Cape is Ms Celeste Booth (021 483-9685).	ECO	Construction
Project employees and any contract staff should maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Eskom/Contractor	Duration of contract
Apply for sampling permits from SAHRA for work on any archaeological sites identified as needing intervention – in other words any archaeological site that will be directly affected by the proposed transmission power lines, substation or access roads.	Eskom/Contractor in consultation with Specialist	Duration of contract
In the event of a find of human remains: 1) leave the remains in place, nothing should be moved	Eskom/Contractor in consultation with Specialist	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
2) Cordon off the area 3) Call Ms Mary Leslie at SAHRA (021 4624509) 4) Contact an archaeologist 5) Once an archaeologist has examined the find, the archaeologist/SAHRA should contact SA Police services and the state pathologist to report human remains 6) If the human remains are found to be a legitimate burial or a pre-colonial burial, an emergency exhumation permit will be issued by SAHRA or HWC 7) If a crime is suspected, a police docket will need to be opened.		

Performance Indicator	» No disturbance of heritage sites outside of designated work areas. » All heritage items located are dealt with as per the legislative guidelines.
Monitoring	» Observation of excavation activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported, and appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites. » An incident reporting system should be used to record non-conformances to the EMP.

OBJECTIVE: To ensure all construction activities/practices/procedures are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMP

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager (and ECO).

A Method Statement is defined as “a written submission by the Contractor in response to the environmental specification or a request by the Project Manager/Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Project Manager/Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or

will produce results in accordance with the Specifications". A Method Statement must cover applicable details with regards to:

» Construction procedures
» Materials and equipment to be used
» Getting the equipment to and from site
» How the equipment/material will be moved while on-site
» How and where material will be stored
» The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur
» Timing and location of activities
» Compliance/non-compliance with the Specifications, and
» Any other information deemed necessary by the Project Manager/Site Manager.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager/ECO (or as per the reporting structures in the Ankerlig OCGT Power Station EMP), except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

MANAGEMENT PLAN: OPERATION AND MAINTENANCE CHAPTER 5

5.1. Overall Goal for Operation

Overall Goal for Operation: To ensure that the operation and maintenance of the Ankerlig Power Station Conversion and Transmission Integration Project does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the proposed project in a way that:

» Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
» Enables operation and maintenance activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, farming practices, traffic and road use, and effects on local residents.
» Minimises impacts on birds in the area.

This addendum to the approved EMP must be read in conjunction with the relevant sections and appendices of the Ankerlig OCGT Power Station EMP (Revision 1 dated September 2008). This addendum relates only to activities associated with the operation and maintenance of the Ankerlig Power Station Conversion and Transmission Integration Project. Generic environmental specifications and guidelines applicable to the power station and power line operation and maintenance included within this approved EMP are not repeated here.

5.2. Objectives for Operation and Maintenance

In order to meet the goal for operation and maintenance, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: Maintain the noise levels around the power station site within acceptable levels and minimise the impact on residential areas and communities

The results of the noise impact assessment undertaken as part of the EIA indicate that the potential impact of the power station conversion project on the overall noise levels in the noise-sensitive areas of Atlantis may be of Moderate significance. With the implementation of mitigation measures, this impact is expected to be of low significance.

Project component/s	List of project components affecting the objective: » Air filters » Gas compressor » Gas turbine » Generator » Electricity transformers » Fans associated with the stacks » Heat recovery equipment » Steam generator » Steam turbine » Air-cooled condenser system associated with the dry-cooling system
Potential Impact	» Increased noise levels in the surrounding areas, noise nuisance and sleep disturbance of the affected communities
Activity/risk source	» Power station components (as listed above)
Mitigation: Target/Objective	» To minimise noise levels generated by the facility as far as possible

Mitigation: Action/control	Responsibility	Timeframe
Regular maintenance of equipment shall be undertaken throughout the operation of the power station	Eskom	Operation
Training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.	Eskom	Operation
Implement the noise management and monitoring plan as per the approved EMP (dated September 2007)	Eskom	Operation

Performance Indicator	» The measured noise levels around the boundary of the site to be less than 70 dBA during day-time and 60 dBA during night-time. » The noise levels in Avondale and Protea Park residential areas not to exceed 50 dBA and 45 dBA during daytime and night-time respectively, due to the power station operations.
Monitoring	» Annual noise monitoring throughout the operational lifespan on the perimeter of the power station. The closest residential area to the site and at two selected locations outside the perimeter should also be included. » The noise monitoring should be performed in accordance with SANS 10103 and the report submitted to the appropriate authority.

OBJECTIVE: Management of dust and emissions to air

The main air pollution sources identified to be associated with the proposed power station conversion include:

» The turbine combustion emissions during the normal operation phase.
» The turbine combustion emissions during start-up and upset conditions.

The exhaust emissions during normal operation, start-up and upset conditions could have a negative impact on the air quality of residential townships in close proximity to the power station. The type of emissions are not expected to change from those currently generated by the 9 OCGT units, since instead of being released into the atmosphere after the turbines, as the gases from the OCGT plant will pass through a heat recovery system and then be released. The only variations to the OCGT emissions will be the different release heights of the new stacks and the temperature of the emitted gases. These changes could have a small additional negative impact on potentially sensitive receptors in the vicinity of the power station.

Project component/s	Project components affecting the objective: » Converted power station units
Potential Impact	» Emissions from CCGT unit stacks
Activities/risk sources	» Operation of the power station
Mitigation: Target/Objective	» To ensure emissions are minimised, where possible, for the duration of the operation phase

Mitigation: Action/control	Responsibility	Timeframe
Implement stack heights at 60m or higher	Eskom	Operation
Investigate additional mitigation measures to further reduce nitrogen dioxide emissions	Eskom	Operation
Introduce natural gas as a fuel source as and when available	Eskom	Operation
Implement the air pollution management plan as per the approved EMP (dated September 2007)	Eskom	Operation

Performance Indicator	» The measured hourly and annual nitrogen dioxide levels due to the power station's operations at local communities around the power station to be in compliance with South African ambient NO2 air quality standards » No complaints from affected residents or community regarding emissions

Monitoring	Monitoring will be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods: » In-stack monitoring of emissions » Monitoring of nitrogen oxides at local communities » A complaints register will be maintained, in which any complaints from residents/the community will be logged. Complaints will be investigated and, where appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimisation of visual impacts

The primary area of potential visual impact of the CCGT units associated with the converted power station would occur along Dassenburg Road within a 200 m radius of the power station conversion and additionally constructed infrastructure. Other sources of visual impact include any additional lighting which may be associated with the power station conversion.

The area of potentially high visual impact is indicated within a 500m buffer zone from the transmission power line.

Project component/s	List of project components affecting the objective: » CCGT units (~60 m high stacks) » Water storage tanks » Additional fuel storage tanks » power line and service road for power line servitude
Potential Impact	» Enhanced visual intrusion
Activity/risk source	» Size/scale of CCGT unit stacks (~60 m in height) and associated lighting » Power line
Mitigation: Target/Objective	» To minimise potential for visual impact » Minimise contrast with surrounding environment and visibility of the turbines to humans

Mitigation: Action/control	Responsibility	Timeframe
Ensure careful planning and sensitive placement of any additional light fixtures, and ensure the fitment of covers and shields designed to contain, rather than spread the light.	Eskom/ lighting engineer	Erection and maintenance
Ensure timely maintenance of the CCGT units, ancillary infrastructure and the general surrounds of the property (gardens, access roads, etc.) in order to prevent the visual impact of degradation and perceived poor	Eskom	Operation and maintenance

Mitigation: Action/control	Responsibility	Timeframe
management		
Natural hues that compliment the natural environment (such as is currently the case) must be used to soften the general appearance of the power plant.	Eskom	Erection and maintenance

Performance Indicator	» Minimised visual intrusion on surrounding areas
Monitoring	» Ensure that adequate safety lighting is installed before construction is completed and are functional at all times

OBJECTIVE: Protection of vegetation and faunal habitats

Indirect impacts on vegetation during operation and maintenance activities could result from maintenance activities and the movement of people and vehicles along the power line servitude.

Project component/s	List of project components affecting the objective: » Power line servitudes and associated access roads
Potential Impact	» Disturbance to or loss of vegetation and/or habitats
Activity/risk source	» Movement of employee and visitor vehicles within and around site
Mitigation: Target/Objective	» To minimise impacts on flora and faunal habitats » To ensure and encourage plant regrowth in areas of post-construction rehabilitation

Mitigation: Action/control	Responsibility	Timeframe
Vehicle movements shall be restricted to designated roadways	Eskom	Operation
No new roads shall be created	Eskom	Operation
Existing roads shall be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Eskom	Operation
During maintenance activities, unnecessary disturbance to habitats shall be strictly controlled. Avoiding any sensitive habitats with maintenance vehicles must be ensured.	Contractor in consultation with Specialist	Duration of contract
No bushcutting may occur within the High and Medium sensitivity sections of the servitudes (as detailed in the EIA Report). If it is proven essential, the maximum frequency permitted should be once every ten years.	Eskom	Operation
Implement the weed eradication programme as	Eskom	Operation

Mitigation: Action/control	Responsibility	Timeframe
detailed in the approved EMP (September 2007)		
Ongoing, annual alien plant management must be undertaken in the High and Medium sensitivity sections of the servitudes (as identified in the EIA Report). Methodology used must comply with DWAF methodology for control of *Acacia saligna* and *Acacia cyclops*. Key elements include: alien clearing must be undertaken by well trained teams using the right equipment; all stems must be cut by hand (not heavy machinery); all cut stumps must immediately (within 5 minutes) be painted with a suitable herbicide that contains a visible dye (in order to prevent resprouting, and to ensure that all stems are painted); no spraying of herbicide; cut stems must be neatly stacked at the outside edges of the servitudes, or preferably removed from the servitudes to an approved organic waste dump site.	Eskom	Operation

Performance Indicator	» No further disturbance to vegetation » Continued improvement of rehabilitation efforts
Monitoring	» Observation of vegetation on-site by Site Manager » Annual monitoring by an independent consultant to ensure that alien vegetation is being cleared appropriately from the High and Medium sensitivity areas (as identified in the EIA Report), and to ensure that these areas are not being bushcut more than once every ten years.

OBJECTIVE: Protection of avifauna

Bird interactions with the power lines can be anticipated during the operation phase of the power lines. These are, however, well researched in the South African context (through the EWT and Eskom partnership). The main impacts expected are as a result of collisions with the earth wire and disturbance of bird species in the area.

As a result of long-term monitoring, Eskom are in a position to make use of 'bird-friendly' towers and conductor configurations for their power lines.

A number of mechanisms exist through which birds are able to cause electrical faults. These include:

» Bird streamer induced faulting, whereby the fault is caused by the bird releasing a "streamer" of faeces which can constitute an air gap intrusion between the conductor and the earthed structure.
» Bird pollution, whereby a flashover occurs when an insulator string gets coated with pollutant, which compromises the insulation properties of the string.
» Bird nests, which may cause faults through nest material protruding and constituting an air gap intrusion

Project component/s	List of project components affecting the objective: » power line
Potential Impact	» Loss of birds as a result of collision with the power line earth wire » Disturbance to bird species in the area as a result of maintenance activities » Impact of birds on quality of supply
Activity/risk source	» Overhead power line
Mitigation: Target/Objective	» Ensure bird-friendly towers are installed and maintained.

Mitigation: Action/control	Responsibility	Timeframe
Marking of the earth wires shall be undertaken on the high risk sections of the power line with an appropriate, Eskom approved marking device according the Eskom guidelines.	Eskom / specialist	Operation/ maintenance
Bird Guards shall be installed on all self-supporting towers according to the existing Eskom guidelines in order to prevent birds from perching in high-risk areas on the towers directly above live conductors.	Eskom / specialist	Operation/ maintenance
During maintenance activities, unnecessary disturbance to habitats shall be strictly controlled. Avoiding any sensitive habitats with maintenance vehicles must be ensured.	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	» No additional disturbance to avifaunal populations along the length of the power line route » Continued improvement of avifaunal protection efforts
Monitoring	» Observation of avifaunal populations and incidence of injuries/death from collisions with the power line » Regular inspections to monitor casualties from collisions - delegate a suitable on-site monitor to assess avian mortality associated with the power lines.